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MODEL Airplane NEWS

SUMMER PREVIEW!

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MODEL Airplane NEWS

JULY 2001 • VOLUME 129, NUMBER 7

ON THE COVER: the Great Planes J-3 Cub comes in for a landing on Lake Candlewood in Connecticut (photo by Walter Sidas). This fabric-covered, giant ARF is equally at home on wheels and floats. Inset: Hitec's affordable, versatile Eclipse 7 transmitter is compatible with Hitec's Spectra module, so you can use it on all frequencies.

Features

Construction

Field & Bench Reviews

Columns

Departments

EDITORIAL

BY DEBRA SHARP

What's new in RC?

The Toledo RC Model Exposition attracts a diverse crowd that spans several generations and interests. Whether you're interested in giant-scale warbirds, ½A sport planes, ARFs, kits, or the latest park flyers, you're sure to find them there. The number of new RC models and products unveiled this year confirms our belief that the industry and hobby continue to expand in all directions. From the latest powerplants to the smallest new electronics, the sophistication of models and accessories continues to increase even as their price tags decrease. For this month's special "Air Scoop," we've compiled six pages of our favorite new products—the latest in RC goodies.

Slope racing isn't for the faint-hearted. This Dave Garwood photo captures the high-speed excitement of an Unlimited-class event.

Also in this issue, Rich Uravitch's coverage of the 4th annual Jets over Florida extravaganza offers an inside look at the high-tech world of RC jets. Turbine-powered models dominated this fun fly, and it's clear that the reliability and realism of turbines have captured the attention of modelers everywhere.

Our feature construction article is of a sport-scale, A-10 Warthog that uses two O.S. .25 prop engines for power. Designer Keith Sparks notes that the model is really a "low-wing trainer that looks like a jet." It offers good slow-speed performance and straightforward construction.

When most of us think of slope soaring, we envision relaxed flying as models gracefully surf the updrafts. Well, Dave Garwood's feature, "Introduction to Slope Racing" shows that flying at the slopes can also be an adrenaline-pumping, heart-pounding experience; in fact, slope sailplanes hold the record for the fastest RC model at 243mph! See how you can join in on the action on page 32.

In the latest of his "IMAC Aerobatics" series, Dan Wolanski explains how to fly a torque roll. The article's clear instructions and illustrations are sure to make it easier for all who want to master this guaranteed show-stopper.

It's no surprise that the popularity of small, easy-to-build park flyers has invigorated scratch-building, and these projects have also rekindled an interest in extremely lightweight covering materials. In our February 2001 issue, Dave Robelen showed a modern approach to applying a traditional tissue finish, and this month, he offers tips for working with lightweight plastic, such as Mylar, RA Microlite and even colored Reynolds Plastic Wrap! Not only are these materials inexpensive and easy to use, but they also look great; check out Dave's article on page 82.

MODEL Airplane NEWS

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AIRWAVES

Our readers write back

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous number of letters we receive, we cannot respond to every one.

JET-SETTER

What do you do with a 10-year-old Italian kit that is supposed to be given to a new jet model builder? Warped fuselage; no plans; and the kit was made for a pulse jet with no interior linings. In all fairness, I didn't think I could give it to anybody to build, least of all a new jet modeler. I decided to build the thing myself!

So, what do we have? We have the Aeromacchi MB-339A/PAN, which weighs 13½ pounds dry. "PAN" stands for, in Italian, national aerobatics team.

The plane has a 66-inch wingspan, is 61 inches long and has a wing area of 726 square inches and a wing loading of 43 ounces per square foot (a little on the heavy side, but I think it's going to be fine).

Unfortunately, because of the aircraft's low stance, the tail scrapes at 8 degrees. The weight on the nose gear is just about right—8 percent of the aircraft's weight, and that's with ½ pound of lead in the nose. I finished it in hardware store Krylon spray paints and Goldberg's Ultracote clear coat. The markings are by Savage, and guidance is by Airtronics. I power it with a slightly modified K&B (as described in an article in the March 2001 issue of *Model Airplane News*). There's also a Ramtec fan and shroud and an 11¾-inch MAC pipe. Installed, the fan turns 21,500rpm running on Byron fuel (20 percent oil, 10 percent nitro) plus 5 ounces of Klotz Bean oil. The tailpipe velocity is 140mph, and static thrust is 8 pounds. Its flight dynamics are very good—not outstanding, but it's very pleasing to the eye and flies at about a jet trainer speed.

COL. ROBERT E. THACKER

Thank you for sharing your latest project with us. DS

HOMEGROWN DECALS

On page 100 of the November 2000 issue, there's a review of Vitagraphics' Vita-Cal water-slide decal paper, which can be slid through a home ink-jet printer to produce custom model decals. I bought the product and am very happy with the decals I make. Thanks for bringing this great aid to scale modelers to your readers' attention.

It seems to me that you could use a word-processing program such as Microsoft Word and type in any number of letters, numerals and other simple aircraft markings if you had the correct font styles. In particular, I want to make "military block" letters, and I'd like to find a military-stencil font so that I'd be able to make the small markings such as "No step," "Lift here," "Ground here" and "No push" that are so evident on military aircraft. Is this font available, and if it is, where can I find it?

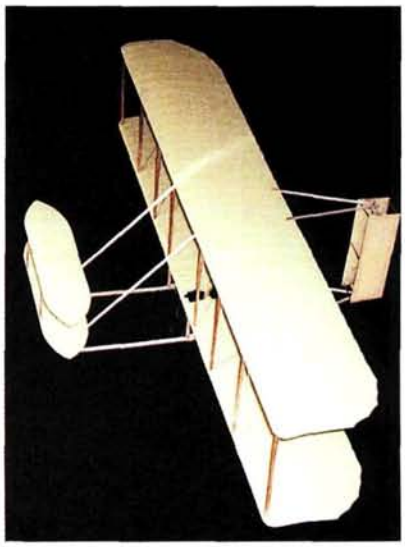
BILL PAEZ, FRESNO, CA

Bill, when I discovered Vita-Cal decal paper, I wanted to do exactly what you want to do. I tried the standard available "stencil" fonts, but they were too stylized for scale models. On the Internet, I found a company that offers custom fonts; you pay to download these files and then add them to your word-processor program's font arsenal. TLai Enterprise Media Design offers several fonts that are suitable for scale aircraft, and they range in price from $12 to $16. I downloaded AmarilloUSAF, LongBeachUSN and MD Military Stencil A—USAF and US Navy letters and nomenclature stencil fonts that look great!

Downloading is easy and installation instructions are provided. So head over to www.tlai.com/med_des/modeling.html, or write to TLai Enterprises, 10573 West Pico Blvd., PMB #70, Los Angeles, CA 90064-2348. Good luck with your homegrown decals. GY

CENTENNIAL WRIGHT FLIGHT

With the approaching centennial of the 1903 Wright brothers' flight, I would like to construct a Wright Flyer—model A or B—in plastic or balsa covered with paper. I'd like a model that's 8 to 12 inches long, but I haven't been able to find one anywhere. When I ask at hobby shops, I am usually met with barely comprehending stares.



I haven't had any luck on the Internet. Does any company market a kit or plan? [email]

CHARLES D. SEVERSON

Charles, you are in luck. Nick Ziroli Sr. has been working on a small park-flyer-size Wright Flyer model A, and we will soon feature it as a construction article. It's true to scale and designed for a pair of geared Speed 280 motors. Keep your eyes open for this one.

Also contact Arizona Model Aircrafters—(480) 348-3733. At the Recent Toledo Model Expo, that company showed a beautiful scale RC Wright Flyer; the company specializes in laser-cut model kits and has produced a number of 1/12-scale, static-display wooden kits. If there is enough interest, they might make a miniature Wright Flyer. GY

3-VIEW VARIETY

In many issues, you include a 3-view drawing and photo documentation for scale modelers. This is fantastic! Please keep "Planes Worth Modeling" coming. Could I order a 3-view drawing of other planes,

such as the P-51D? I couldn't find information for this in the magazine. [email]

HARRY J. RIETHER

Thanks for the encouragement. We enjoy publishing "Planes Worth Modeling" because it offers readers free scale documentation that can be clipped out and used to start a more complete documentation package. We know that readers who build scale models for competition really appreciate this.

The plans we publish come from contributors or are drawn especially for the column, but these drawings aren't sold in a larger format. "Scale Aircraft Drawings"—WW I (Vol. 1) and WW II (Vol. 2)—might be of use to you. They include several scale drawings from Wylam and Nye. Alternatively, call Air Age mail-order service at (800) 537-5874 and ask whether a specific scale drawing is available. GY

WW I ARF MODELS

I was wondering whether you are going to review the new Global ARF Fokker D-VII. I have been into RC since I took a build-and-fly class last year at Capstone Hobbies in Westerville, OH, with Mike Barbee. It was a wonderful experience. Capstone put together a fine program to get newcomers into the hobby successfully, and local club fliers are always willing to help, too. I haven't had much time to learn how to fly (only two flights so far), but I feel that this will be a lifelong hobby. I think that I am going to be more of a flier than a builder, though.

My favorite aircraft designs are WW I fighters. After reading Chris Chianelli's article on the Global ARF Blue Max, I decided to get one and transfer the radio and engine (O.S. .46 FX) from my trainer. I think this will spark my interest to get out to the flying field more often. I am afraid to fly my trainer because if I crash it, I will need to invest even more time in it before I can fly it again. With an ARF, I can just order another piece or keep extras on hand. I would eventually like to make the Global ARF Fokker D-VII my second plane and go 4-stroke (or maybe even electric), and who knows where from there? I applaud Global for making affordable WW I ARFs.

TIMOTHY LINARD

Columbus, OH

You're in luck, Timothy; a review of the Fokker D-VII is already in progress. If this model flies half as well as it looks, it's sure to be a winner. We'll keep you posted. CC

ERRATA

In the June 2001 "Air Scoop," we cited an incorrect manufacturer for the EZ Mustang. The EZ line of ARFs is distributed exclusively by MRC/Altech Marketing, P.O. Box 7182, Edison, NJ 08818-7182; (732) 225-6144; fax (732) 225-0091; www.modelrec.com. Look for a review of this great-looking model in a future issue of *Model Airplane News*.

The Toledo RC Model Exposition keeps getting better and better, with almost too many new products to count. Once again, we've expanded "Air Scoop" to cover the highlights. Look for more great products next month.

Summer Preview!

The latest products have arrived!

YS PERFORMANCE

140DZ

YS engines have always been known for horsepower, but the new 140DZ reaches new heights in user-friendly operation as well. A new low-pressure fuel system makes adjustments much easier, and intake-valve injection eliminates a major cause of detonation in conventional designs, thereby increasing power and prolonging the life of your engine. The 140DZ is the perfect size for IMAC aircraft in the 11- to 15-pound range.

YS Performance, (775) 265-7523; www.ysperformance.com; perfspec@aci.net.

ALTECH MARKETING

EZ Mustang

Akiko Kimura holds the latest ARF from EZ. Once again employing EZ's patented covering-skin techniques, this .45-size Mustang features beautifully simulated polished aluminum that will stand out proudly at any flightline. Like other EZ scale models (Zero 45 and Texan), the Mustang is realistically detailed with panel lines, rivets and weathering. Kit includes: chrome cowl and spinner; retracts; wheels; fuel tank; and bomb. Specs: wingspan—54.7 inches; wing area—532 square inches; power required—.40 to .45 2-stroke or .50 to .70 4-stroke; weight—5.75 to 6 pounds.

Altech Marketing, (732) 225-6144; www.modelrec.com.

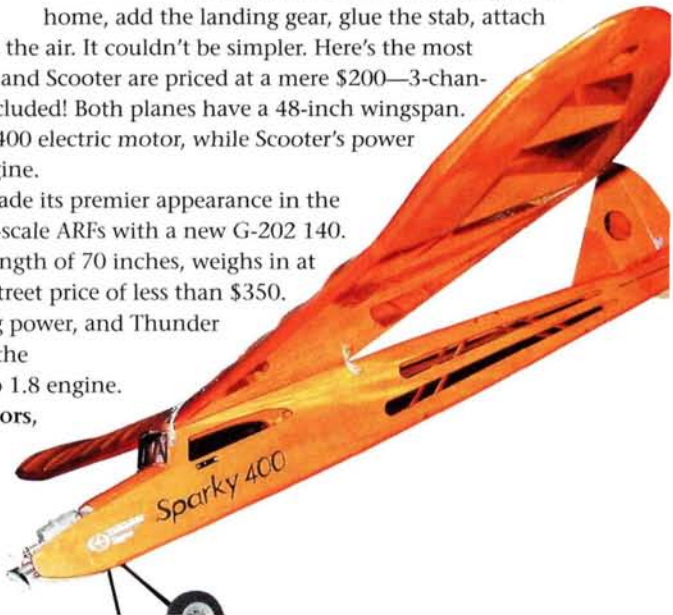
ACE HOBBY DISTRIBUTORS

Sparky, Scooter and a giant Giles

No, we're not introducing new cartoon characters; Sparky and Scooter are two of the most completely assembled airplanes we've ever seen. Just take either of these planes home, add the landing gear, glue the stab, attach the wings, and you're in the air. It couldn't be simpler. Here's the most amazing feature: Sparky and Scooter are priced at a mere $200—3-channel Hitec Focus radio included! Both planes have a 48-inch wingspan. Sparky runs on a Speed 400 electric motor, while Scooter's power comes from a GP-07 engine.

Thunder Tiger also made its premier appearance in the world of aerobatic giant-scale ARFs with a new G-202 140. It has a wingspan and length of 70 inches, weighs in at 10.6 pounds and has a street price of less than $350. A big plane demands big power, and Thunder Tiger recommends that the G-202 be run on a 1.2 to 1.8 engine.

Ace Hobby Distributors, (660) 584-7121; www.acehobby.com.



GREAT PLANES

Gee Bee & Tiger Moth ARFs

There's no mistaking a Gee Bee Z for anything else at the field, and there's no mistaking the topnotch workmanship that goes into every Super Quality Series ARF from Great Planes. This ⅕-scale racer has all the style and charm of the original in an 80-percent-built ARF. It sports a 56.4-inch wingspan and weighs in at 6.4 pounds. You'll need to supply your own .46ci 2-stroke or a .52 4-stroke, but all the hardware is included.

For those who seek something a little less racy, there's the graceful de Havilland DH82 Tiger Moth ARF. The plane is covered in MonoKote and features a painted fiberglass cowl. At 71 inches, the wingspan qualifies the Tiger Moth as IMAA-legal. Powered by a .61ci 2-stroke or a .91ci 4-stroke, this bipe is sure to please.

Great Planes, (800) 682-8948; www.greatplanes.com.

MULTIPLEX

Four-motor Cargo

Multiplex is delivering a full payload of fun with the new Cargo. Powered by four Speed 400 motors direct driven but with an option for 2.33:1 gears, the Cargo can carry up to 1 pound of payload in its servo-operated cargo compartment. The wingspan is 56 inches, and the model requires the standard four channels, plus one for the cargo door. It sounds great with four props spinning and is perfect for dropping parachutists or carrying cameras.

Multiplex, (800) 375-1312; www.multiplexrc.com.

SR BATTERIES

Cutie

SR Batteries has long been a friend of the electric RC enthusiast, supplying high-quality Ni-Cd packs as well as electric power systems and accessories and even a few kits. The latest is the appropriately named Cutie—a 46-inch-wingspan model powered by a Speed 400 geared 2.33:1. It has 350 square inches of wing area, so it should fly very smoothly, and the 10 cells supplying the juice should give it solid performance.

SR Batteries, (631) 286-0079; www.srbatteries.com; larry@srbatteries.com.

HORIZON HOBBY INC.

Saito 3-cylinder, Pizazz & Pico Cub FD

Looking for an engine that performs well and looks good, too? Look no further than Horizon Hobby's new Saito 90 3-cylinder radial. With three .30-size cylinders working together in perfect unison, as well as superb transition and throttle response the Saito 90 could be the only engine you'll ever need for any .60- through .90-size scale project. And the folks at Horizon have been busy because that's not all they shared with us in Toledo. Another recent addition to the Horizon line is the Hangar 9 Pizazz 40 ARF. This plane virtually guarantees 3D flying fun. The Pizazz has a wingspan of 48 inches and can be fitted with an MDS .48 or .58 2-stroke engine.

For all you slow-flyer fans out there, Horizon has also introduced the new Pico Cub FD and the Pico Stick FD. Both kits can be easily assembled in less than two hours, and both enjoy the added stability and strength of a full fuselage. The Picos are well suited to the featherweight GWS Naro Flightpack system.

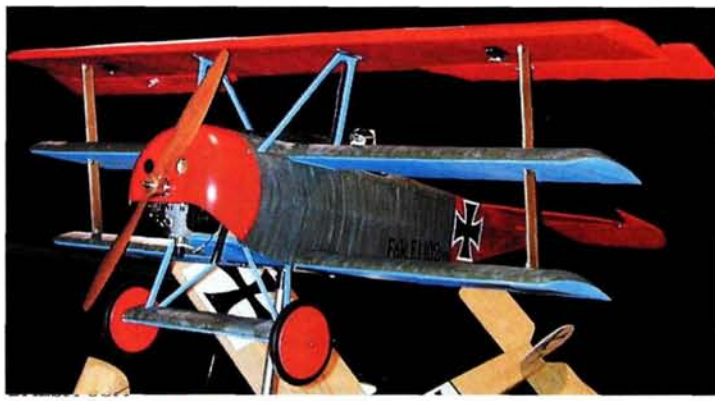
Horizon Hobby Inc., (217) 335-9511; www.horizonhobby.com.

CARDEN AIRCRAFT

40-percent Edge 540

At 118 inches wingtip to wingtip, Carden Aircraft's 40-percent Edge 540 fairly shouts performance. What you might not expect of a plane this size are its gentle 3D and slow-speed characteristics and easy assembly. Features such as removable wing panels and the anodized-aluminum tube-and-socket system make this giant as easy to handle on the ground as it is in the air. With the recommended 120 to 150cc engine, unlimited aerobatics are just a push of the throttle away.

Carden Aircraft, (828) 697-7177; www.carden-aircraft.com.



Fokker DR-1 Triplane

This ¼-scale replica of the infamous WW I Fokker DR-1 is both easy to build and easy to fly. The Fokker DR-1 makes use of many interlocking die-cut parts that speed construction and improve accuracy. The kit comes with an ABC cowl, formed wire gear and hardware. It has a wingspan of 70 ¾ inches and can be powered by a 1.20 to 1.50 4-stroke or a G-23 gasoline engine.

Balsa USA, (800) 225-7287; www.balsausa.com; balsausa@cybrzn.com.

SIG MFG.

Rascal ARF

Hazel Sig-Hester holds Sig's popular Rascal RC plane now comes as an ARF. Available in green and violet, the kit includes a Maxx Speed 400 geared motor and a Sig 20A ESC with BEC—all for $170! Built of balsa and lite-ply, the Rascal ARF remains true to the original kit in size, weight and design. It has a 49-inch wingspan and requires a 3-channel mini system with two servos.

Sig Mfg., (641) 623-0215; www.sigmfg.com.

LANIER RC

Giant Sukhoi & Edge 540 ARF

High above the Lanier RC booth was Bubba Spivey's newest addition to the world of IMAC aerobatics: a 37-percent-scale Sukhoi. This impressive giant-scale kit features CAD-generated plans, laser-cut and CNC router-cut wood parts and interlocking fuselage construction. The Sukhoi has plug-in wing panels with foam wing-cores and a hefty aluminum carry-through tube, an all-wood turtle deck, formed-aluminum landing gear, plug-in stabilizer halves, a clear, vacuum-formed canopy and a fiberglass engine cowl. Like all of Bubba's kits, it includes easy-to-follow plans and instructions. The 120-inch aerobat is designed for a 120- to 150cc gasoline engine. Also on display was Lanier's new Edge 540 ARF. This ¼-scale, wood-and-foam model is designed for a .90 to 1.20 2-stroke or a 1.20 to 1.80 4-stroke engine and has a wingspan of 72 inches. The airfoil-shaped stabilizer halves plug in, and the fiberglass engine cowl comes painted. A formed-aluminum landing gear, wheel pants and a clear canopy are also part of the package. Perfect for sport flying or IMAC competition, the Edge 540 will get you into the air in short order.

Lanier RC, (770) 532-6401; www.lanierrc.com

HIROBO

World Champion Giichi Naruke's Stream 50 and Sukhoi 31M

Long respected for its high-quality helicopter line, Hirobo has also been building a name for itself in the ARF airplane market in Japan. Now these high-quality, all-wood models are coming to the states, courtesy of Altech Marketing. First to become available will be the Sukhoi 31M and World Champion Giichi Naruke's Stream 50. Both are covered with film in the schemes you see here. Sukhoi 31M: wingspan—57 inches; wing area—554 square inches; weight—5.5 to 6 pounds; engine required—.32 to .46 2-stroke or .52 to .70 4-stroke. Stream 50: wingspan—54 inches; wing area 573 square inches; weight—5.25 to 5.75 pounds; engine required—.32 2-stroke or .52 to .56 4-stroke.

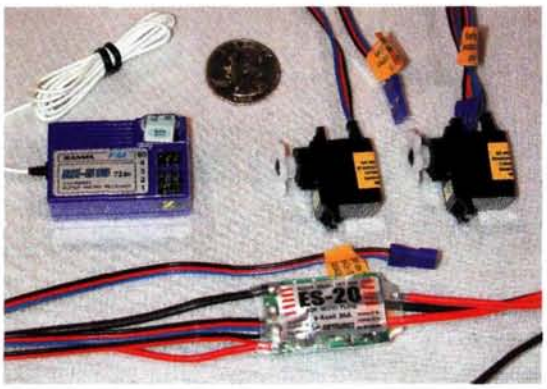
Altech Marketing, (732) 225-6144; www.modelrec.com.

DJ AEROTECH

Profile Micro RC "Roadkill Series"

Profile models are a cool way to get a scale look while keeping weight down on micro RC models. DJ Aerotech has produced half a dozen flattened flyers it calls the "Roadkill Series" for 3-channel indoor and backyard RC. The six are silhouette models of popular WW II-era warbirds: BF 109F, F4U Corsair, P-51 Mustang, P-38 Lightning, Spitfire and Zero. All pieces are laser-cut balsa and plywood, and each kit includes a motor, prop and reduction drive.

DJ Aerotech, (937) 773-6772; www.djaerotech.com.



AIRTRONICS

RC gear–flight pack

Park, slow and micro flyers are among the fastest-growing segments of the model industry—a fact not lost on the folks at Airtronics. They've come out with a neat little flight pack that incorporates a micro 5-channel, single-conversion receiver, two super microservos and a mini ESC. But they didn't stop there; they also offer radio systems with the VG400 transmitter and micro RC gear packaged together, so micro enthusiasts can get just what they need all at once.

Airtronics, (714) 978-1895; www.airtronics.net.

ELECTRIC JET FACTORY

Three New Brushless Motors

Check out these new brushless, sensorless motors from Electric Jet Factory. These Hacker motors can be used with ducted fan and various other electric models. All include various wind options as well as a gearbox option. The B20 is a good replacement for Speed 280 and 300+ motors; the B40 is equivalent to a Speed 480+ motor; and the B50 is interchangeable with a Speed 500 or 600+ motor.

Electric Jet Factory, (520) 579-5609; www.electricjetfactory.com; robert@electricjetfactory.com.

Continued on page 22

FUTABA

2FR and 3FR transmitters

Big news from Futaba concerns its 2- and 3-channel, single-stick transmitters. The 2FR and 3FR systems both feature V-tail mixing and servo-reversing for aileron and elevator, and because the aileron and rudder are controlled with one stick, the radio feels much like a conventional 4-channel. They are comfortable to hold, easy to operate and will make excellent, affordable entry-level radio systems. Because they come with lightweight airborne packs, they're also well-suited to park flyer models.

Not all the goodies were reserved for beginners, though; Futaba also debuted its two, new, 6-channel PCM systems for airplanes and helis: the 6XAPS and the 6XHPS. The speed and precision afforded by the stepless 1024 PCM operation and the R138DP PCM receiver make them perfect for competition. They retain many of the useful features of previous 6X series radios, too.

Futaba, distributed by Great Planes, (800) 682-8948; www.greatplanes.com.

NORTHEAST SAILPLANE PRODUCTS

VIP Racer

Blow away the competition with this sleek new pylon racer from Sal DeFrancesco at Northeast Sailplane. This 27-inch beauty comes with fully molded parts and surfaces, premade pushrods and a strong, carbon-fiber molded fuselage. A Speed 400 power package makes the VIP race-legal, but if you want to *really* turn and burn, a high-performance power package with a Kontronics 150 motor is also available.

Northeast Sailplane Products, (802) 655-7700; www.nesail.com.

ASTROFLIGHT

Power for Park Flyers

New at the AstroFlight booth was a 0.8-ounce proportional speed control for the popular Astro 010 brushless motor. The motor/ESC package costs only $120 and is a perfect power source for 10-ounce models. AstroFlight also introduced a 4:1 geared version of the popular Firefly motor; it will turn a 4½-inch-diameter prop at about 8,000rpm with 400mA of current and is well-suited to 5-ounce flyers. Last but not least, a new Model 200 speed control for the Firefly motors is now available.

AstroFlight Inc., (310) 821-6242; www.astroflight.com.

FMA DIRECT

Copilot Dave

Learning to fly has never been easier, thanks to "Dave," a brand-new, two-axis flight stabilizer from FMA. This unit weighs less than an ounce and keeps your model level by sensing the heat difference between earth and the atmosphere; this means it won't be "confused" by buildings, water, or variations in terrain. We hear that this unit can even land your model safely!

Also new from FMA is this 4-channel FM transmitter, the T80RF. Among its many features are servo-reversing, three-rate throw selection, exponential control and elevator/aileron mixing. It's available by itself or with any FMA flight pack, from indoor and park flyers to giant-scale models.

FMA Direct, (800) 343-2934; sales@fmadirect.com; www.fmadirect.com.

HOUSE OF BALSA

Micro Electric Cub

From the folks at House of Balsa comes this Micro Electric Cub. Constructed entirely of balsa and ply, the Cub requires 3-channel, sub-miniature RC gear and runs on an AstroFlight 010 brushless motor. With a suggested retail price of $44.95, this Cub makes entering the exciting world of micro-electric flight both easy and affordable.

House of Balsa, (760) 246-6462; www.mag-web.com/RC-modeler/hobnew; hobandzap@aol.com.

HOBBY LOBBY INTL.

Jeti "Phasor" brushless motors and speed controllers

The advantages of brushless motors are well known; they're powerful, efficient and maintenance-free. Up until now, they've been expensive, too, but Hobby Lobby is looking to change that by offering a line of Jeti "Phasor" brushless motors and speed controllers at very affordable prices. Four sizes are available; the smallest can handle models of up to 45 ounces, and the largest can power planes that weigh up to 158 ounces. Motors and controllers can be purchased separately or paired together.

Hobby Lobby Intl., (615) 373-1444; www.hobby-lobby.com.

BOB VIOLETT MODELS

Turbine-powered BobCat

Bob Violett Models has the perfect solution for all you aspiring jet pilots who have had to forgo flying a turbine-powered model because your field can't handle them: the BobCat! This 66-inch-wingspan sport model was specifically designed to fly off shorter, rougher fields and in tighter confines than conventional turbines can. Its slow speed and easy landing characteristics make it a good turbine trainer, and it performs very well powered by the RAM 500.

Bob Violett Models, (407) 327-6333; www.bvmjets.com.

JET HANGAR HOBBIES

BAe Hawk ARF

This beautiful, 53-inch-wingspan ARF comes out of the box pretty much as you see it here: fully hinged and detailed, with a gelcoat-finish fuselage and the foam wings covered. All the hardware is included; the builder need supply only the .45 to .48ci engine, a ducted-fan unit, radio gear and retracts (if desired).

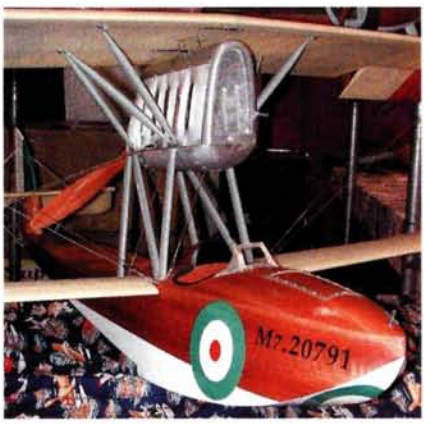
Jet Hangar Hobbies, (562) 467-0260; www.jethangar.com.

SLIMLINE MFG.

SL 2000 Battery Base

For 25 years, Slimline has been coming up with great RC support equipment. Its latest is the SL 2000 Battery Base, which has a wide, weighted footprint to prevent it from tipping. It holds a 1-gallon fuel bottle with a stainless-steel clamp. The best benefit, in our opinion, is the self-contained, cordless fueling operation offered by the SL 2000. The heavy cast-aluminum base (with a red powder-coat finish) holds 10 AA batteries and has an auto-reset fuse.

Slimline Mfg., (480) 946-9800; www.slimlineproducts.com.



3 SEA BEES MODELS

1918 Fighter/racer

Take a trip into the past with this Macchi M-7 from 3 Sea Bees. This 1/5-scale replica of the float-race-winning 1918 Italian flying boat and fighter runs on a .80 to .90 2-stroke or .90 to 1.20 4-stroke. The model weighs in at nearly 15 pounds and has a wingspan of 79.5 inches.

3 Sea Bees Models, (425) 334-6089; www.3seabees.com; 3seabees@3seabees.com.

READERS' TIPS & TRICKS

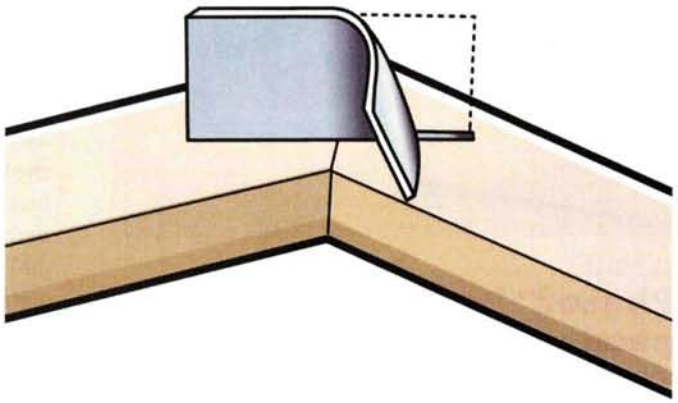
WITH ILLUSTRATIONS BY DAVID BAKER

SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Readers' Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.

PLAYING THE SLOTS

If you want a strong joint between two pieces of wood, use your hinge-slotting tool. Glue the pieces together as you usually do, then cut a slot across the joint. Slide a CA hinge into the slot, secure it with thin CA, then trim it flush with the surface and sand it smooth. The hinge won't be visible, and the joint will be much stronger.

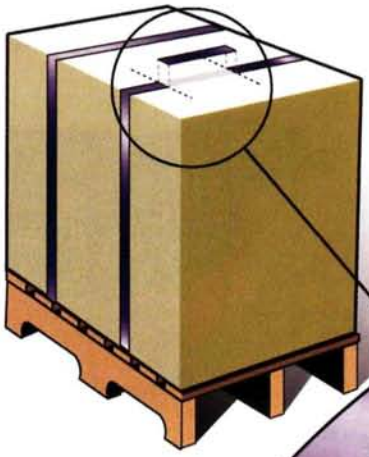
Phillip Ploof, Bradenton, FL



BAMBOO TAILSKID

If you're searching for an authentic-looking tailskid for a scale old-timer, try using a tine from a bamboo rake. Such rakes are easy to find, and bamboo is easy to work with and glue.

Loren Schmidt, Elk Grove, CA



FLEXIBLE STRAIGHTEDGE

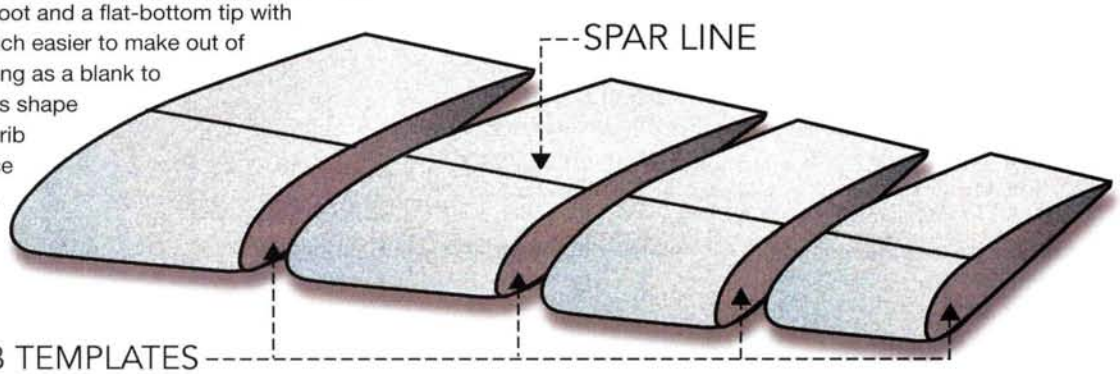
A length of flat steel band of the type used to secure packing crates makes a great flexible straightedge for marking lines on curved surfaces such as those on the fuselage and wing. The band can be cut to any length; I find 18- and 36-inch pieces most useful. Round the bands' ends with a file, and sand them smooth to avoid scratching or gouging the wood or your fingers. If you drill a hole in one end, you can hang your "straightedge" from a pegboard or nail in your shop.

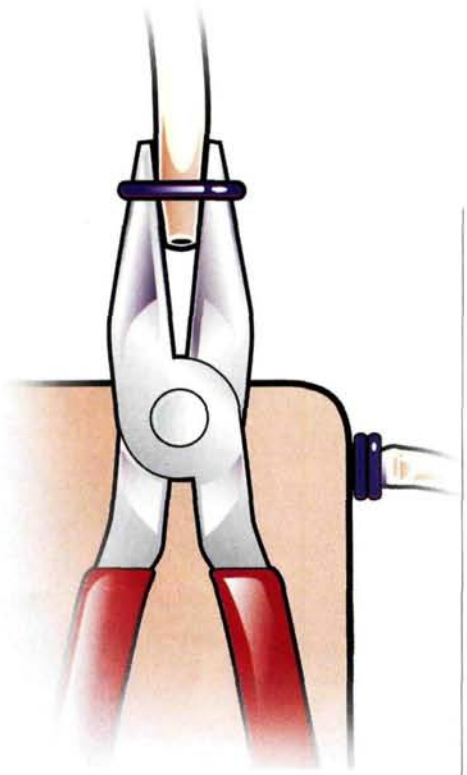
Ward Kelley, Slidell, LA

DRAWING A BLANK

Drawing out ribs can be tricky when you're building a tapered wing. Try a wing with a symmetrical root and a flat-bottom tip with washout! These shapes are much easier to make out of foam. Why not make a foam wing as a blank to create your ribs? Get the foam's shape just right, then mark out all the rib and the spar locations, and slice the foam to make templates to use when you cut your balsa.

Dave J. Cooper, Napier, New Zealand

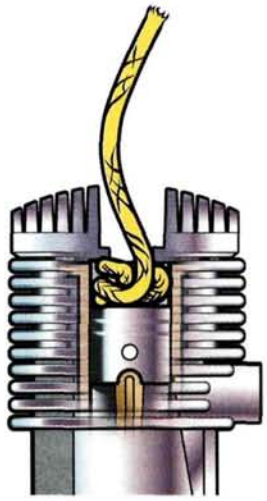




FUEL-LINE FASTENERS

One-eighth-inch-i.d O-rings (no. 006, BS-0-1) offer an excellent way to secure your fuel-line connections because they fit standard fuel line perfectly. Stretch the rings with needle-nose pliers, slip the fuel tubing through, then push the ring off the pliers and into position. The pressure from the ring will hold the tubing tightly over fuel nipples, metal tubes, fittings and clunks.

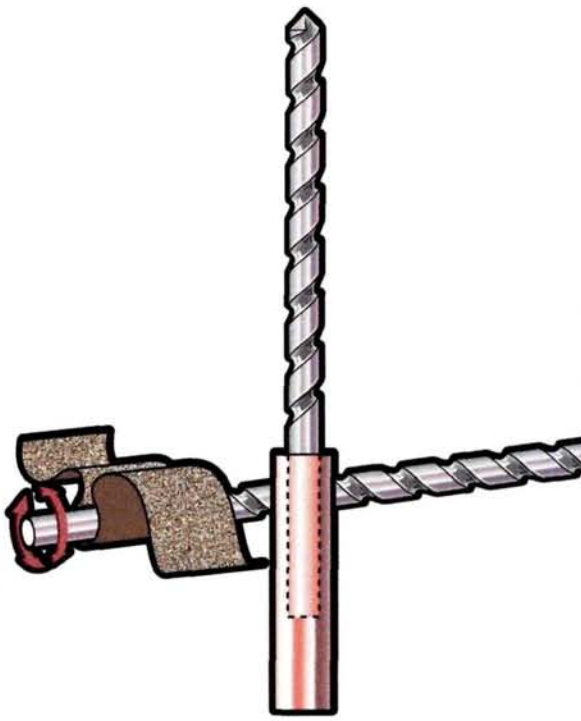
Brian Winch, Lurnea, Australia



PISTON PILLOW

Lots of people resort to wedging a screwdriver or some other tool into the exhaust port to block piston travel while they try to loosen a stubborn prop nut. Lots live to regret it, too, when that tool nicks the piston or sleeve. It's safer to remove the glow plug and feed a length of soft nylon cord into the cylinder. As the piston rises, the cord evenly distributes the force and blocks the piston's travel without any metal-to-metal contact.

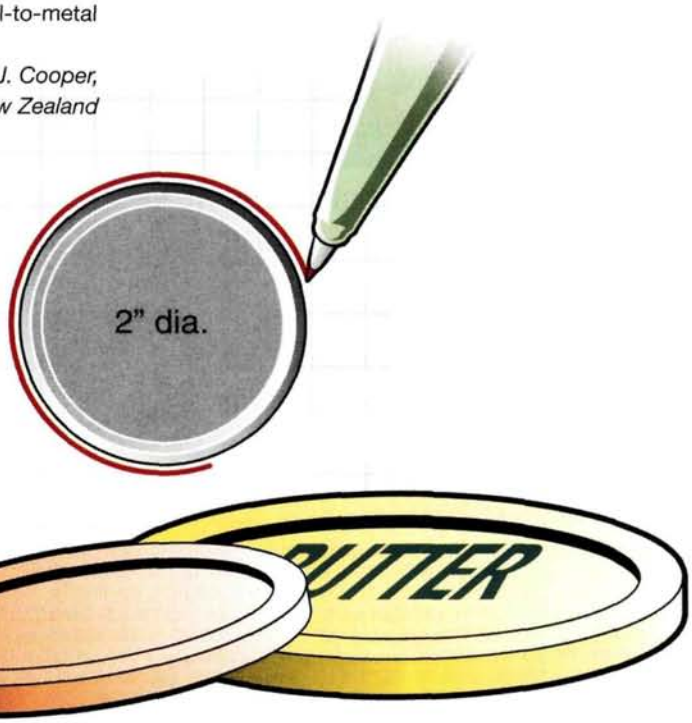
Dave J. Cooper, Napier, New Zealand



BITS TO FIT

Modelers sometimes have to drill holes in places that regular drills can't reach. When you find yourself in a tight spot, make your own flexible pin drill. Scuff the top of a drill bit with sandpaper, slip it into a length of Nyrod, then CA it into place (add a little baking soda to the CA for extra strength).

Richard J. Kastner, Dayton, OH



TOPNOTCH CIRCLES

Accurate, smooth circles really make a difference when you draw construction plans. A compass works, but it leaves behind a hole in the circle's center and can sometimes slip while you're drawing. Plastic container lids make excellent templates for drawing circles. They come in many sizes, are easier to move around than a compass, and they won't slip or poke holes in your plan. For quick reference, mark the size of the lid.

Don Sektnan, Eagan, MN

PILOT PROJECTS

A look at what our readers are doing

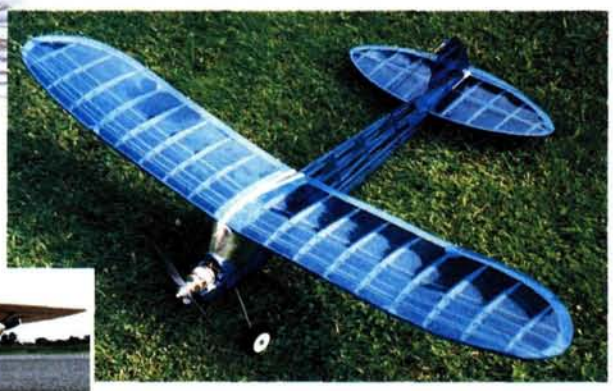
SEND IN YOUR SNAPSHOTS. ***Model Airplane News*** **is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.**

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

WALKS ON WATER

This versatile 1929 Heath Super Parasol can land on both earth and water. According to owner Mike Hawkins of Bangkok, Thailand, the wheeled version is simply a breeze to fly. Maneuvering the floatplane version proves a little more complicated because the model is less stable. Mike loves to show off both versions of his bathing beauty. He took the wheeled version to a ¼-scale meet in Las Vegas, NV, and set it down on water at a Florida meet.



MIGHTY MICRO DODGER

John Stennard of Bristol, England, sent this photo of his 32-inch RN Kits Brooklyn Dodger. Though it was originally fitted with a Schlosser .25 diesel engine and 2-channel radio, John has seen a dramatic improvement in its flight performance since he installed an AstroFlight Mighty Micro 01 brushless motor and 6, 270mAh cells. John says his Dodger is stable, simple to fly and easily stays in the air for more than 10 minutes.

FIRST TIME'S A CHARM

This Carden Extra 300S, powered by a 3W 80, can be seen soaring above a turf farm in Exeter, RI, where Steve Winter and his fellow flying enthusiasts like to take to the skies. This is Steve's very first 35-percent scale model, and he "just can't say enough about how great it flies." We think your Patty Wagstaff Extra looks pretty great too, Steve.

TWICE THE FUN

Peter Curtis of Hyattsville, MD, sent us this photo of his friend Foster Blair of Alexandria, VA, and his P-82 Twin Mustang. This spectacular plane was built from two modified Herr Mustang kits. It has a 50-inch wingspan and is powered by two Norvel .061 engines. It is controlled by an Airtronics computer radio. Foster has the engine controls set so that he can control each throttle separately. According to Peter, this P-82 not only flies smoothly and tracks perfectly, but it also has great aerobatic capability and nearly unlimited vertical performance.

BANGKOK'S BEST

Chaisak Saeng-Xuto of Bangkok, Thailand, is proud to share this photo of his Dornier DO 335, "Pfeil." His friend, Mr. Sittisak, built the plane from an Al Masters plan published in *Model Airplane News*. The model is powered by a YS 140FZ and has an 80-inch wingspan. Chaisak has been flying model planes for more than 45 years, sharing his love of RC flight with his fellow members of the Don Muang RC Club, where this photo was taken. The club is only a stone's throw away from the Bangkok International Airport, site of several international competitions including the very first Asia-Pacific RC Aerobatic Competition.

◄ WESTERN WONDER

This Western Auto/Breitling Academy 232 is one of two CAP planes built by Steve Meyer, a Civil Air Patrol pilot from Round Rock, TX. Steve built his plane from a Midwest kit, and it's powered by an ASP .46 swinging an 11x7 APC prop. Believe it or not, the decals are actually a product of Steve's laser printer! Why does Steve like the CAP so much? Because it stands for Civil Air Patrol!

SUPER SCALE KADET ►

Dave Schwarzen of Festus, MO, painstakingly scratch-built this scale U.S. Navy Stearman PT-17 from a set of modified Bengt Norman plans. He also based his model on actual photographs of the full-size plane, which he found on the Internet. This 1/7-scale Stearman is powered by a SuperTigre 75 and weighs in at 7 pounds. Dave says that the plane, which took about one year to complete, handles superbly.

AGING BEAUTIFULLY

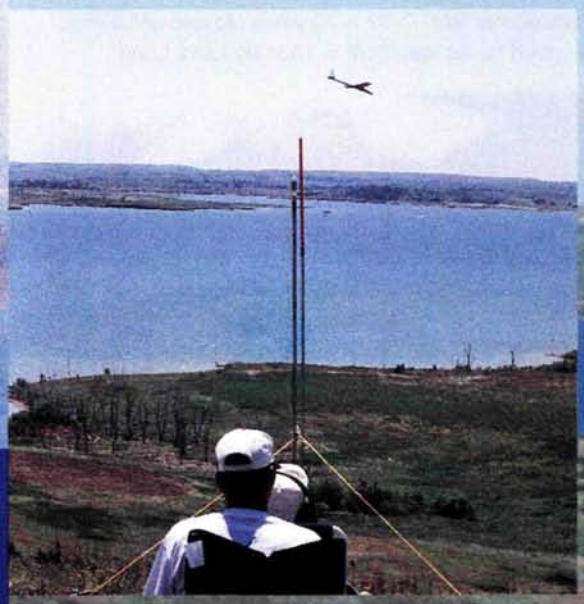
Believe it or not, the "Starduster Too" G-62 is 20 years old and still flying. We think it looks pretty good for its age. Built in 1981 by Larry Long of Candor, NC, the Starduster weighs approximately 25 pounds and is covered in MonoKote. When performing aerobatic maneuvers, its B&B smoke system decorates the skies.

CUSTOM CREATION

Kern Hanson of Hayward, CA, created this neat little park flyer he calls "U-Name It." This twin is made of parts from old planes and has a steerable nosewheel. Kern flies it with a variety of battery packs, including CR-2s. It's amazing what you can build with imagination and spare parts!

◂ DOUBLE TROUBLE

Herr Engineering Inc.'s P-51 and Pitts Special certainly do make a striking duo. Carl Malta of Jamestown, NY, is the proud papa of both planes. The P-51 is powered by a Thunder Tiger .10 engine that runs on 15-percent fuel. According to Carl, the P-51 has taken off, flown and landed flawlessly for more than 30 flights.The Pitts is powered by an O.S. .10 and a Hitec radio with mini servos.



Above: Rich Loud's and Charlie Richardson's 60-inch-span, Fun-1 ODR-class racers made by CR Aircraft fly at Wilson Lake, KS, during the Midwest Slope Challenge. Right: pilot's view of the near turn markers.

INTRODUCTION TO SLOPE

by Dave Garwood

Racing is in our blood. We like fast cars, fast boats and fast airplanes, and when two or more fast vehicles get together, we often want to find out which has more speed. At 243mph, slope sailplanes have been the fastest planes in aeromodeling for two decades (and officially, they still are), although turbine-powered models may soon claim this record.

Slope racing is the most exciting form of RC sailplane flying for many, but existing slope-racing organizations are not evenly distributed across the continent. It isn't difficult or expensive to stage your own slope race and participate in some of this wild action yourself. What you read here and find online can get you started in slope racing wherever there's wind and a suitable hill.

The contents of this article come from my "man-on-man" slope-racing experience in Kansas, Vermont, Washington and Canada. I haven't yet tried an international variation, F3F racing, in which planes individually run against the clock, so this article concerns only man-on-man slope racing; I hope to cover F3F slope racing in the future.

SAILPLANE SELECTION

You can race nearly any sailplane, from hand-launch gliders, polyhedral trainers and slope planes of all descriptions to 3m, full-house F3B ships. Sailplanes designed and built for racing generally have aileron and elevator control (rudder is optional)

RACING

PHOTOS BY DAVE GARWOOD

Bottom photos, left to right: the far turn of the Unlimited-class slope race at Kiona Butte during the World Soaring Jamboree in Richland, WA. Note signal lights and turn judges. • New York Slope Dogs Wayne Rigby, Rich Loud, Dave Garwood and Joe Chovan all contributed photographs to this article. Thanks, guys. These pilots are really happy with their CR Aircraft Fun-1 ODR racers (photo by Loren Blinde, taken at Midwest Slope Challenge). • Pilots Joe Chovan and Paul Naton turn and burn at the near turn in ODR-class heat. Callers are Todd Wilson and Charlie Richardson. Note countdown timer at left. • Tim Cone launches before an International Slope Race F3F run at the Torrey Pines gliderport in La Jolla, CA (photo by Brian Laird).

and tend to be heavier and stronger than thermal-duration sailplanes of similar size. Many slope-racing planes carry simple 2-channel radio sets, and that's all you may need for many seasons of racing, but "technology creep" being what it is, some advanced racers add flaps coupled with elevator for quicker pylon turning, and on larger planes, rudder coupled with aileron for coordinated turning.

With the introduction of EPP foam to model aircraft construction over the last five years, designers have been working to develop "bounceable" slope racers. The problem of light-wing stiffness in wings longer than 50 inches has not been solved in a commercial offering that I'm aware of, but I have seen early flying trials of a prototype-design, EPP-foam, 60-inch racer. Foamie warbirds have been a hit in club racing, and 50-inch-span Mustangs and Messerschmitts made by Dave's Aircraft Works, MAD Aircraft Design, Mountain Toys and Patton Aircraft are eagerly pressed into service as practice planes and organized into racing classes at events such as the annual Midwest Slope Challenge organized by the Lincoln (NE) Area Soaring Society (LASS).

A great many aileron slope sailplanes are available, such as the Avocet from Northeast Sailplane Products, the Ninja and Samurai from Sig Mfg. and the Renegade from CR High Performance Aircraft. These and others have been raced for many years and continue to provide the cost-effective performance needed for club and informal racing.

Unlimited-class racers resemble the mighty 6-servo F3B sailplanes, designed to turn hard and carry plenty of ballast to raise the wing loading to 30 ounces per square foot and higher. We have dedicated unlimited slope-racing aircraft such as the Raider from CR High Performance Aircraft, the Brisk from ShredAir and unlimited thermal-duration planes redesigned for racing, such as the Prism Racer from Northeast Sailplane Products and the Predator from Slegers Intl. Some of these incorporate high-tech materials and molded-construction technology; others have more traditional sheeted-foam wings.

The cost of purpose-designed sailplanes may be beyond the reach of many beginning slope racers, and Paul Naton began working on this problem when he was the slope coordinator for the Torrey Pines Gulls in San Diego. Paul developed the One Design Racing (ODR) class specification,

Unlimited class launch.

Racers prepare to launch in an ODR-class heat. Pilots are Paul Naton and Ed Harris; callers are Charlie Richardson and Scott Miller.

Front view of the near turn. Front to rear, the turn judges are Alden Shipp, Steve Roman and Loren Blinde.

HOW TO GO FAST

Charlie Richardson, a California racer, designer and maker of slope-racing sailplanes, won the ODR class at the 2000 Midwest Slope Challenge at Wilson Lake, KS. Here he shares his knowledge about slope-racing preparation and high-performance flying with *Model Airplane News* readers. These are Charlie's hints, tips and tricks:

RACE PREPARATION AND SETUP

1. Practice flying. At any slope-flying site, pick two points to simulate a racecourse and work to consistently turn in the same place at both ends of the course. The nose of the aircraft traces a flat pattern, parallel to the horizon, all the way around the course. Maintain the same altitude around the entire course. Turn at the same place consistently and keep the plane level; do not let the plane balloon up in the turns.

2. Practice race starts. Practice counting down and judging the course entry timing. A common mistake is to enter the course late; the fatal mistake is to enter the course early.

3. "Detune" CG position. A lot of pilots are happier with a less sensitive, more forward center of gravity balance point. A forward CG tends to stabilize the plane in high-ballast conditions.

4. Detune control throws. In normal flying, you want to have quite a bit of control authority. On a racecourse, you want small control throws; just enough to bank the plane and pull around the turn.

5. Bring spare parts. You may need spare wing bolts, batteries, or a receiver on short notice to continue in a race. Duplicate all parts needed, up to and including a spare plane!

RACE STRATEGY AND TACTICS

1. Practice on the racecourse. Explore the lift band to find "the zone," the area that produces the highest ground speed on the course. It's best to fly in the upper portion of the lift zone, as during the race, you may be a lot closer to the ground and it's safer to have a margin for error.

2. Fly smoothly. Smooth, steady flying is what wins the race. Any deviation from the shortest possible distance will cost you time. Pilot inputs only slow the plane down; the more you correct the plane, the more slowly you will go.

3. Enter turns smoothly. Races are won in the turns. When I get close to a turn, I begin a gentle bank and gradually increase it in anticipation of the turn. Do not pull the elevator until you hear your caller, or you risk cutting the turn. Don't spend too much time in the bank. Keep in mind that you lose efficiency in a bank; the plane is fastest when its wings are level.

4. Manage the turn radius. Don't turn so tightly that you scrub off too much energy or so widely that you lengthen the course and spend unnecessary time reversing direction.

5. Anticipate the turns. When judging the distance of the plane as it approaches the far turn, rely mainly on its apparent size and its size perspective rather than your depth perception. I try to pick out a bush or other feature in the background to judge the size and distance of the plane. Sometimes the plane's shadow will give you information about its distance. Noting the time it takes the plane to fly down the course is also helpful.

6. Change focus frequently. Shifting focus between the plane and the background can help you judge distance. I change focus rapidly between the plane, the background and the spot in the sky where I'm going to turn. Constantly shifting my attention among the plane, the course and the turn point serves to keep my focus sharp.

which seeks to keep the cost below $200 for an aircraft that is nearly as fast as any 60-inch racer built from exotic materials. The spec is written so an individual scratchbuilder or manufacturer can design and build a competitive race plane at an affordable cost.

The ODR spec and two of Paul's articles on how to go fast with a slope racer are posted on his Radio Carbon Art website, radiocarbonart.com/pages/gallery.html. While you're there, note that Paul's slope-soaring video, "Endless Lift 2," features man-on-man racing, and "Viking Race" records F3F single-plane time trials.

So far, only CR High Performance Aircraft has marketed a kit, the Fun-1, designed to this spec, but I won't be surprised to see others. The Fun-1 is quick to build, flies extremely well and has been a real hit in the last two years at the Midwest Slope Challenge, run annually for seven years by LASS. You can find out more about LASS and the Kansas slope race at www.alltel.net/~mwsc. The ODR spec also appears on this website.

Many more suitable and purpose-designed sailplanes are available than can be mentioned here. The best way to find out about existing and new designs is an Internet website search, using an online search engine or starting with the links at the impressive American Slope Racing Organization website, www.sloperacing.com, or others listed in this article.

The far turn on the Wilson Lake, KS, course during the Midwest Slope Challenge (photo by Wayne Rigby).

COURSE LAYOUT AND EQUIPMENT

A slope racecourse consists of markers at each end of the designated flight area—usually, a pair of poles aligned to define a plane (imaginary flat surface)—perpendicular to the slope face. To complete a lap, the plane doesn't fly around a pylon, but rather, the nose of the aircraft penetrates the imaginary plane defined by the sighting devices, at any distance away from or above the ground.

At the far end of the course, completion of a lap must be signaled to the pilot and his caller; this can be done with lights or flags. Standing close to the near turn marker, the pilot can determine for himself when a lap is completed and make the turn. In organized racing, turn personnel or judges are present at the near turn to call cut turns and to call a "clean start" to each heat (i.e., no sailplanes entered the course too early). Operations go more smoothly with voice communication between workers at the near and far turns, either by radio or by wire.

In addition to the turn markers, signal lights or flags and communications equipment, race organizers need to provide a mechanical countdown device to start the race; this eliminates controversy that may occur when a human counts down this highly emotional portion of the race. The Columbia Slope Racers in Washington prefer an audiotape countdown; LASS pilots use a large mechanical clock. A frequency control board and a standings display board complete the list of required field equipment.

The organizational staffing needed includes turn judges at the far turn, one for each sailplane in the heat, and turn judges at the near turn—two are usually sufficient, even for a four-plane heat. The race director or a near-turn judge can call pilots and callers up to the ready area. Note that each pilot has a caller to help him see the far turn signals, to act as a safety spotter by keeping track of other sailplanes and to help in race strategy and tactical decisions.

For a detailed description of slope racecourse layout and racing procedures, see section 10.4 of the AMA competition rules for slope-soaring contests, available on the Academy of Model Aeronautics website, www.modelaircraft.org. Race organizers who wish to run an AMA-sanctioned contest should understand these rules thoroughly. If your contest rules vary from the AMA guidelines, you can still have an AMA-sanctioned contest if you announce the variations in advance.

Lack of wind on race day is a problem. With today's electronic communications, if racers have preregistered and given an email address, race organizers can make a final wind and weather determination at an announced time, say after the 3:30 a.m.

ONLINE RESOURCES

Internet websites contain far more information than can be presented in a single magazine article. Among those included here are slope-racing organizations, manufacturers, suppliers, flying sites, local weather information and slope humor.

Academy of Model Aeronautics	www.modelaircraft.org
American Slope Race Organization	www.sloperacing.com
Albuquerque Soaring Association	soarabq.org
Charles River Radio Controllers	www.charlesriverrc.org
Dave's Aircraft Works	www.davesaircraftworks.com
Durable Aircraft Models	www.durableaircraftmodels.com
F3X.COM (F3B/F3J/F3F/60-inch racing planes)	f3x.com
Glider King	www.gliderking.com
Inland Slope Rebels	ourworld.compuserve.com/homepages/ISR
LASS Midwest Slope Challenge	www.alltel.net/~mwsc
MAD Aircraft Design	www.madaircraft.com
Midwest Sloping	www.gtdesign.net/soaring/html/midwest.html
Mountain Toys	netnow.micron.net/~mtntoys
Multiplex USA	www.multiplexrc.com
Northeast Sailplane Products	www.nesail.com
Patton Aircraft	home.earthlink.net/~pattonacft
ShredAir	www.shredair.com
Sig Mfg.	www.sigmfg.com
Slegers Intl.	www.slegers.com
SoCal Man on Man Racing Series	www.gliderking.com/race/socalmom.htm
Slope Trash Magazine	slopetrashmagazine.webjump.com
Southern California Slope Racers	www.sloperacing.com
Terry Trimble's Soaring Tools	www.geocities.com/CapeCanaveral/Galaxy/4907
Torrey Pines Gulls article archive	www.torreypinesgulls.org/articles.htm
Radio Carbon Art	www.radiocarbonart.com
USA Viking Race Team Qualifier	sloperacing.com/Viking/vrqualifier.htm
Warbird Air Racing (WAR)	sloperacing.com/PSS_MoM.htm

National Weather Service forecast, and make an official go/no-go decision early in the morning. They may post this determination on a website, along with the reschedule date in case the race has to be postponed due to low wind speed or unsuitable wind direction.

RACE DAY

If you're lucky, trees and bushes will be swaying when you roll out of bed on race day, as the more wind you have, the faster the planes will fly. Get to the flying site early, so you can help the race organizers with last-minute preparations, if needed. Early arrivals may also have a chance to practice on the actual racecourse, and this is likely to improve your flying during the race.

The pilots' meeting will cover several topics, including racing class specifications; the number of planes in each heat; frequency control and landing area; and the penalties for early starts, cut turns and safety violations. It's not unusual for a pilot to fly back and re-enter the course for an early start or fly back out and make the turn for a cut turn. Safety rules and procedures will be discussed; a safety violation such as flying over turn workers may result in a disqualification. Based on a final weather observation, the time for the first heat is announced, and pilot/caller teams scatter to the pits to decide how much ballast to carry and perhaps make final weight-and-balance tweaks or radio program adjustments.

The "air boss" calls a flight group to the start area. Callers display the top and bottom of each aircraft for identification to the far turn judges and receive an acknowledgement by flag or light signal, indicating the color of flag or light that signals your plane has reached the far end of the course. When sailplane identification is complete, callers launch, and all planes in the air fly outside the racecourse in an effort to build altitude, which will be converted to speed at the start of the heat.

Callers watch or listen to the countdown device, which signals the start of the race, and help the pilot judge when to begin the dive to enter the course. Too early, and you have to go around; too late, and the other guys have a jump on you. The planes tend to fly together in the high-lift band, and this may result in close positioning at the first turn. One of many tactical decisions you'll make is whether to fly up and out to keep your plane in less crowded airspace, or to fly close to the hill in maximum lift. You'll also decide on how much to anticipate the far-turn judge's signal to shorten your total distance traveled.

Be mentally prepared to recover from a cut turn, either a loop or a circle back, because the closer the race, the greater the temptation to cut turns close. The recovery flying forced by a cut turn may or may not prevent you from winning a heat, as keeping pressure on your opponents can force them to cut a turn later in the race.

Smooth flying maximizes your speed because each control surface deflection adds drag, and each variation from a straight path increases your distance flown. The goal is to fly the required number of laps smoothly and efficiently without "scrubbing off" too much energy in the turns. You may want to dive through the final lap and finish the race down the slope, or you may want to hug the lip and fly in the compression zone. Your experience with your plane and observations of others flying the course will help you to make this decision.

When the heat is finished, try to force yourself to relax and set up for a safe landing. It's grim when you damage your plane on landing, but it can easily happen with racer's adrenaline in your veins. Go pick up your plane, return to the pits, check for damage and discuss with your caller how you might better fly the next heat.

As you calm down, your knees stop knocking and your heart rate returns to normal, you may agree that slope racing really is the most exciting form of RC sailplane flying. Be prepared to become addicted to this sport; you'll probably be back to race again and, if you don't live near organized slope races, you might even find yourself starting one!

__CR High Performance Aircraft__, 543 Burma Rd., Fallbrook, CA 92028; (760) 451-0056; crhiperf@earthlink.net.
__Dave's Aircraft Works__, 34455 Camino El Molino, Capistrano Beach, CA 92624-1070; (949) 248-2773; daw1@access1.net; www.davesaircraftworks.com.
__MAD Aircraft Design__, 15268 Rolling Ridge Dr., Chino Hills, CA 91709; (909) 606-0363; madair@madaircraft.com; www.madaircraft.com.
__Mountain Toys__, 2184 N. Oak Hills Dr., Meridian, ID 83642; (208) 887-6399; tom.henscheid@hjheinz.com; netnow.micron.net /~mtntoys.
__Northeast Sailplane Products__, 948 Hercules Dr., Ste. 12, Colchester, VT 05446; (802) 655-7700; sal@nesail.com; www.nesail.com.
__Patton Aircraft__, 10262 Alder Ct., Rancho Cucamonga, CA 91730; (909) 987-4240; pattonacft@earthlink.net; home.earthlink.net /~pattonacft.
__Radio Carbon Art__, P.O. Box 2311, Corvallis, OR 97339-2311; (541) 752-9661; naton@proaxis.com; www.radiocarbonart.com.
__ShredAir__, P.O. Box 10093, Eugene, OR 97440; (541) 945-6842; dieter@shredair.com; www.shredair.com.
__Sig Mfg.__, 401 Front St., Montezuma, IA 50171-0520; (515) 623-5154; flysig@netins.net; www.sigmfg.com.
__Slegers Intl.__, 35 Hacklebarney Rd., Long Valley, NJ 07853; (908) 879-9964; sales@Slegers.com; www.slegers.com.

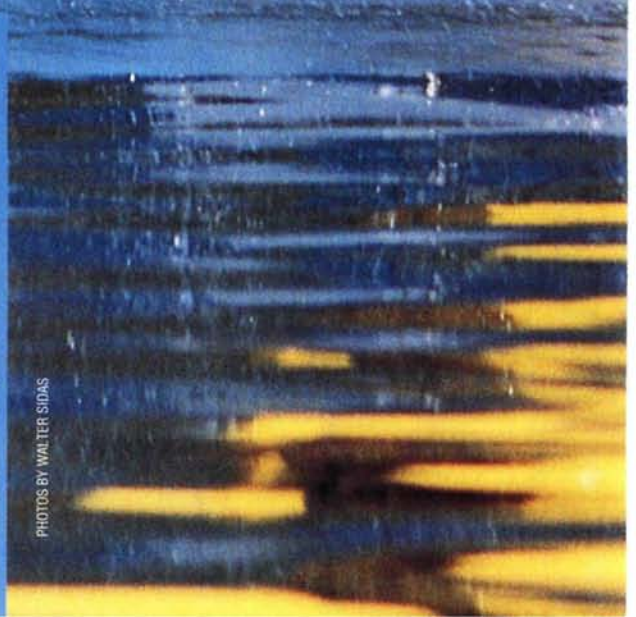
MODEL AIRPLANE NEWS
FIELD & BENCH
REVIEW

GREAT PLANES

Piper J-3 Cub ARF

by Jim Onorato

A classic IMAA-legal sport plane for land or sea



PHOTOS BY WALTER SIDAS

SPECIFICATIONS

Model: Piper J-3 Cub

Manufacturer: Great Planes Model Mfg. Co.

Type: sport-scale ARF

Airfoil: modified flat bottom

Wingspan: 81 in.

Wing area: 984 sq. in.

Weight: 11 lb., 5 oz. (with floats)

Wing loading: 26.5 oz./sq. ft.

Length: 49 in.

Radio: 4-channel with 5 servos (throttle, rudder, elevator, aileron)

Engine range: .40 to .46 2-stroke or .48 to .70 4-stroke

Engine used: O.S. FS-70 Surpass

Street price: $230 (kit); $44.99 (float kit)

Features: all-wood, fabric-covered ARF. Everything is included except the radio, engine, propeller, spinner nut, fuel tubing and pilot. The generous hardware package includes hinges, an adjustable engine mount, preformed landing gear, self-adhesive decals, gelcoated fiberglass cowl, dummy engine, vacuum-formed windshield and formed cockpit windows that pop into place from inside the fuselage for an attractive flush fit.

HITS

- Nice scale outline.
- Well-built with high-quality materials.
- Excellent, step-by-step instruction manual.
- Vacuum-formed windshield and cockpit windows.
- Good flight performance.

MISSES

- Bulky landing-gear fairing and wing strut-mounting blocks.
- Strut hinges subject to tearing.

The Piper J-3 Cub is probably the most widely recognized airplane ever built. It first appeared in 1935, and more than 5,000 of them were produced by the beginning of WW II! This enormously popular, two-man trainer is said to have introduced nearly 75 percent of WW II aviators to flying. The Cub proved to the general public that airplanes could be both safe and economical. Models of this classic airplane are offered by dozens of manufacturers and can probably be found at most RC flying fields on any given Sunday. Great Planes offers Cubs in several sizes, including this 81-inch-span, fabric-covered ARF that is made of high-quality materials. This latest entry into the world of Cubs is easy to build and fly.

Because I do a great deal of float flying, I decided to outfit the Cub with a pair of Great Planes Sport Floats. I knew it would be a natural on water.

THE KIT

The fine quality of this kit was obvious as soon as I opened the box. It is built using balsa and ply and comes fully covered with 21st Century fabric. The various parts are individually wrapped in cellophane bags. Everything is included except the radio, engine, propeller, spinner nut, fuel tubing and a pilot.

The kit also comes with a generous hardware package that includes hinges, an adjustable engine mount, preformed landing gear, self-adhesive decals, gelcoated fiberglass cowl, dummy engine, a vacuum-formed windshield and formed cockpit windows that pop into place from inside the fuselage for an attractive flush fit.

An excellent 24-page instruction manual loaded with photos and drawings guides you through the assembly procedure. There is no need for a plan. Although the instructions say this is ¼-scale, its 81-inch wingspan translates to approximately 1/5.3 scale, but it's still IMAA-legal.

ASSEMBLY

First, I used a heat gun to remove the wrinkles from the covering; they came out with very little effort. Next, I removed the covering over the windows, painted the exposed wood surfaces with Cub yellow paint and fuelproofed the firewall and tank compartment. The firewall had

Left: the Great Planes Piper J-3 Cub, straight out of the box. Nearly everything you'll need is included. Below: the Piper J-3 tailpieces are of light, strong construction. When epoxied to the fuselage, the stab and fin fit perfectly into place.

FLIGHT PERFORMANCE

In the 40 years since I first became involved in RC, I have yet to enjoy anything more than flying off water. So when the Cub was complete and fitted with floats, it was time to hit the lake for some real fun. The water was dead calm and the lake was like glass; we really lucked out! We loaded up the boat and headed out to the middle of the lake. I prefer to fly floatplanes from a boat because you have a 360-degree "runway," and retrieval is easy.

• TAKEOFF AND LANDING

After checking out the controls and gassing up, I fired up the O.S. FS-70 and gently set the Cub in the water. The plane got up "on the step" very quickly and really started to accelerate as I advanced the throttle. When it had attained flying speed, I applied just a touch of up-elevator, and the Cub lifted smoothly into the air. The water streaming off the floats was quite a sight! The only trim adjustment I had to make was a bit of down-elevator.

The Cub's light wing loading and extremely shallow glide ratio provide beautiful scale-like landings. You have to be prepared for a long approach when you land the plane because the Cub just floats and floats and floats (pun intended). It just doesn't seem to want to stop flying!

• LOW-SPEED PERFORMANCE

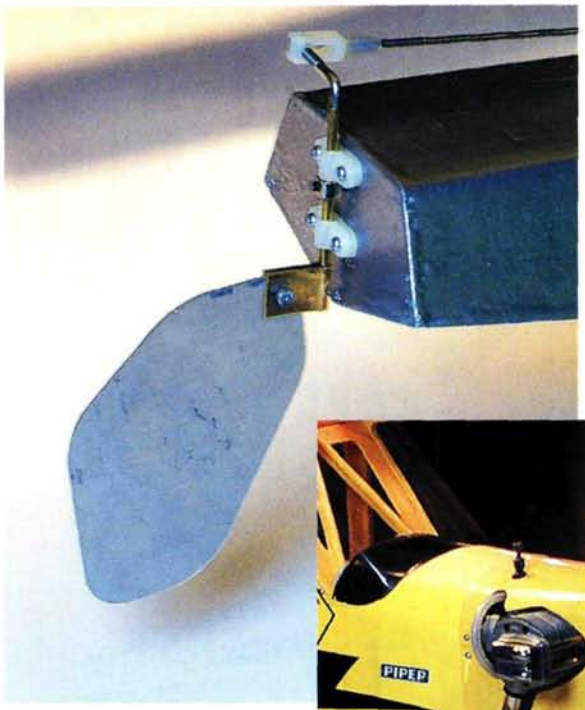
One of the things I like most about the J-3 Cub is its ability to fly at scale-like speed without losing stability. It has a very low stall speed, and its stalls are very gentle. It is just as likely to drop its left wing as its right, but by the time that happens, the Cub is almost standing still.

• HIGH-SPEED PERFORMANCE

Even with the O.S. FS-70 at full throttle, the J-3 is still no barnburner. Its top speed is not really what you would call "high speed," but I really didn't experience bad tendencies at any speed. The model truly flies like a Cub!

• AEROBATICS

The J-3 with a full-size wing is not very aerobatic, but it was never intended to be. It performs graceful inside loops and can be coaxed into a lazy spin. A slow roll can only be achieved with a great deal of aileron, rudder and elevator coordination. As with most floatplanes, the "pendulum effect" of the floats causes the plane to whip around during the last half of a roll. It can even fly inverted, but aerobatics still seem somewhat unnatural for a Piper Cub. Spin entry requires full deflection of all three control surfaces, but recovery is immediate when controls are neutralized.



Right: I installed the O.S. FS-70 4-stroke engine, as recommended by Great Planes. Above: the water rudder is included in the float kit.

already been fuelproofed, but I gave it a coating of thinned epoxy anyway.

After I removed the covering over the aileron servo openings, I glued the wing halves together with 30-minute epoxy. The wing joiner is made of three, 1⅛x5¼-inch plywood pieces that have a combined thickness of 1⅓2 inch. A piece of string passes through the wing from the aileron servo to the root; this is used to pull the aileron servo lead through the wing later on. I cut out the exit holes near the root and threaded the string through these holes before joining the wing halves. The wing is supposed to be built flat with no dihedral, but when I joined the halves, I taped them together tightly so there was no gap at the root ribs, and this resulted in a slight amount of dihedral.

Great Planes recommends an O.S. FS-70 4-stroke engine for the best scale appearance and sound, but 2-stroke engines ranging in size from .45 to .60 are acceptable alternatives. I chose the O.S. FS-70 4-stroke. Your choice of engines determines the location of the throttle servo and throttle pushrod exit on the firewall. An adjustable engine mount and drill template are included in the kit.

I attached the engine mount to the firewall with 8-32 socket-head capscrews and blind nuts. I used the Great Planes Dead Center Hole Locator to mark the location of the engine-mounting bolts then drilled and tapped the mount for 8-32 mounting bolts. To allow the exhaust to exit out the bottom of the cowl, I mounted the engine sideways. I also turned the carburetor around so the needle valve would be on top.

The Piper Cub kit includes a gelcoated fiberglass cowl that doesn't need to be painted. I trimmed the cowl to accommodate the engine and then attached the engine with 4x½-inch sheet-metal screws. The cowl in my kit was quite thin and turned up slightly at the edges, but it looked OK after I installed it. I painted the dummy engine black and silver and glued it to the left side of the cowl.

I attached the wing using two ¼-inch dowels in the leading edge (LE) and two ¼-20 bolts at the trailing edge (TE). The bolts thread into blind nuts that have been inserted into a factory-installed, ¼-inch mounting plate. A precovered wing-bolt plate is also provided to reinforce the TE.

After I removed the covering from the slots in the fuselage, I epoxied the stab and fin into place. Everything lined up nicely without any cutting or shimming. I then added the tailwheel assembly.

The torsion landing gear comes in two prebent pieces and is attached to the fuselage with nylon straps and 2x½-inch sheet-metal screws. There are no cross-braces. Covered landing-gear fairings come with hinged, 3⁄16-inch-thick wooden mounts already attached. I attached the fairing mounts to the fuselage with sheet-metal screws and connected the fairing to the landing gear with small rubber bands; this is an effective way to prevent the fairings from being knocked off when the landing gear flexes, but it is not very scale-like. Also, I thought the fairing mounts were a bit bulky, so after seeing how the landing gear was assembled, I removed them so I could attach the floats.

I cut hinges from the strip of hinge material included with the kit and installed all of the control surfaces using thin CA.

The Cub's roomy fuselage made it easy to install the radio gear, and the step-by-step instructions for installing the servos and pushrods were very easy to understand. Even first-time RC'ers should have no problem installing everything correctly.

The vacuum-formed windshield and cockpit windows are well-made and fit perfectly. The cockpit windows simply pop into place from the inside. Apply RC-56 glue to the flanges on the inside of the cockpit for an easy attachment. This gives the model a neat, attractive, flush-fit appearance.

The last step in the assembly is the addition of the wing struts, which have 3⁄16-inch-thick mounting blocks hinged to the struts at both ends with CA-type hinges. The struts have an airfoil shape and really keep the wings rigid; however, the 3⁄16-inch mounting blocks were much too bulky. As it turned out, the hinges tore after only a few flights. I subsequently replaced all of the strut hinges with a heavier material that I cut from a plastic lid. Incidentally, the struts are functional, and the Cub should not be flown without them!

After completing all of the assembly, I set out to apply the decals, but I ran into a bit of a problem. I usually spray a mixture of detergent and water on the area to which the decal is being applied, so that I can reposition the decal if necessary; when I did this, however, the decals started to curl and would not lay flat. I had to use vinyl for the registration numbers and the lightning design on the fuselage sides. I didn't have any problem with the small decals because I applied them to a dry surface.

I attached Great Planes' size 40 balsa-and-ply Sport Floats to my Piper Cub. The floats come as a kit that includes all the necessary mounting hardware, a water rudder and a ventral fin, but I chose not to use the fin. I covered the floats with fiberglass and spray-painted them with aluminum LustreKote.

CONCLUSION

The Great Planes Piper J-3 Cub is a high-quality ARF that is easy to build and looks great on the ground, on the water and in the air. The fabric covering is perfect for this type of airplane. The model's light wing loading and inherent stability make it an excellent first scale kit. I thoroughly enjoyed building and flying the Piper Cub, and I highly recommend it for both beginners and experienced sport fliers. ✈

21st Century fabric; *distributed by Great Planes.*
Great Planes Model Distributors Co., *P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948; fax (217) 398-0008; www.greatplanes.com.*
LustreKote; *distributed by Great Planes.*
O.S.; *distributed by Great Planes, www.osengines.com.*

MODEL AIRPLANE NEWS
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REVIEW

HORIZON HOBBY DISTRIBUTORS

Voyager E

by Rick Bell

In the past few years, the world of electric flight has really taken off, and the future holds great promise. Small electric helicopters offer a challenging change of pace, and the kits available offer greater opportunities than ever before to experience the joy of RC heli flight.

The electric Voyager E, from JR's helicopter division, is the newest addition to this market. Most of its predecessors are small, light and limited mainly to indoor flight because to be flown outdoors, they require absolutely calm weather. The Voyager E is slightly larger than most of these, so it can successfully handle the great outdoors. This is a real benefit because few of us have access to an indoor facility that's large enough to accommodate electric flight.

Also, most small electric helis have a fixed-pitch rotor that makes them simple to build and reduces the number of parts you have to assemble. The Voyager E takes electric helis to a new level by using 120-degree cyclic/collective pitch mixing (CCPM); the use of this reduces the number of control-system parts required, so the Voyager E exhibits some of the same great flight qualities as larger glow-powered helis, but it's still as easy to build as other small electric helis.

THE KIT

The Voyager E is well packed to avoid its being damaged during shipping. The kit contains many factory-built assemblies, including the chassis, the main rotor head, the swashplate and the washout unit. It also includes a powerful NHM-540ST motor, JR NEA-300H FET electronic speed controller (ESC), finished main blades, a durable canopy and a colorful decal set. The ESC incorporates BEC, which eliminates the need for an onboard receiver battery. The tail rotor is driven by a fine-tooth belt—a simple, light system.

Big performance from a small electric heli

PHOTOS BY WALTER SIDAS AND RICK BELL

SPECIFICATIONS

Model: Voyager E

Type: electric helicopter

Manufacturer: JR

Weight: 4 lb., 7 oz.

Main rotor diameter: 38⅝ in.

Length: 33 in.

Motor inc.: NHM-540ST and ESC w/BEC

Radio used: JR 10X

Gyro used: JR G400

Batteries used: 7-cell, 8.4V, 2000mAh

Street price: $399

Features: assembled chassis, main rotor head, swashplate, washout unit and main rotor blades. Very detailed instruction manual with parts that are packaged and numbered to match the assembly steps. Kit includes powerful 540-type motor and matching speed control with BEC.

Comments: the JR Voyager E is a great little heli that requires little in the way of construction. Its flight is smooth and predicable and, because it's electric, you can fly it indoors, space permitting. Outdoor flights are comparable to those of a .30 heli, although the flights are shorter.

Hits
- Many components already assembled.
- Easy to build.
- Well-written instructions.
- Well-matched power system.
- Wonderful flight qualities.

Misses
- Canopy requires a lot of trimming.

The molded chassis comes assembled.

The parts come in numbered bags that correspond to the assembly steps. To complete the model, you need a CCPM-capable radio, four standard servos or miniservos, a 7-cell 8.4V 2000mAh battery pack and a gyro. The instruction manual is very easy to understand. If you've never built a heli before—or never one with a CCPM—the manual will get you through any problems you may encounter.

ASSEMBLY

This was my first attempt at building an electric heli, so I first thoroughly read the manual because I wanted to understand exactly how the Voyager E would be pieced together and how all the components would work. I wanted to see how well it would perform without the specialized light components, so I used the parts recommended in the manual. I also thought it was important to use components that average heli modelers would have on hand.

As I mentioned earlier, the molded chassis comes assembled. The intermediate gear, front drive pulley and upper and lower main shaft bearings are also installed. You have to decide whether to use standard servos or miniservos. If you choose the latter, you must install the servo adapter plates on the chassis. Be sure to install the adapters with the flat sides facing in. Because I used standard servos, I skipped this step. I screwed the landing gear to the chassis and slid the skids into place. The battery retainers are molded into the landing gear.

Next, I assembled the main mast and drive gear and attached them to the chassis. Make sure that the shaft doesn't have any end play when all the retainers have been tightened. The mesh between the main gear and intermediate gear was perfect; they didn't exhibit any resistance when spun by hand.

I placed the 120-degree swashplate and washout unit on the main shaft and then added the one-piece flybar control arm. I secured the main rudder to the main shaft, engaging the antirotation pin in the slot in the washout unit. I centered the flybar in the rotor head and attached the flybar paddles, making sure that they were parallel to each other and to the flybar control arm.

Following the manual, I next assembled and installed the control rods for the rotor head. The supplied one-way JR ball links must be installed with the JR logo facing outward. I highly recommend that you use the JR ball-link sizing tool that allows you to fit the links on the balls with minimum resistance. This is very important to achieving the best flight performance.

The main shaft and swashplate setup provide excellent cyclic control.

Before I installed the motor, I decided to break it in to seat the brushes (this is not mentioned in the manual). After you've installed the motor and have set the gear mesh correctly, be sure to remove the pinion gear to avoid having the rotor blade start unexpectedly when you make your initial radio adjustments.

I tightened the one-piece tail-gear case on the tail boom and snaked the drive belt through the boom. I enclosed the drive pulley in the tail case and followed it with the tail output shaft. I attached the tail rotor to the output shaft, connected the tail boom to the chassis and added the tail fins. This was all very easy to do.

The next step is the installation of the receiver. I installed JR 517 servos for the CCPM system and then a JR G400 gyro and ESC. Because the chassis is small, the wires must be routed neatly to prevent them from being caught in any moving parts. The manual offers good suggestions for wire placement, and nylon zip-ties are provided for this task.

Next, I installed the tail-rotor pushrod. For optimum gyro performance, make sure that it moves freely without binding. I put a very slight Z-bend on each end of the

FLIGHT PERFORMANCE

I first flew the Voyager E in my garage. During the first hover, the tail boom bobbed quite a bit—a problem that I attributed to the main rotor's speed and to the tightness of the tail belt. I readjusted the main blade pitch, loosened the belt and tried again. This time, the Voyager E flew much better! There was no more bobbing; the heli was very stable. I let it hover in my garage through several battery charges, and everything worked well.

• GENERAL FLYING

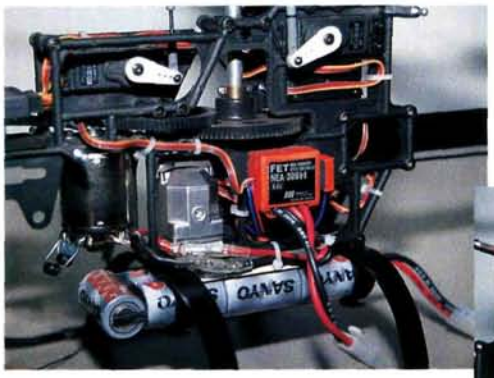
I took the Voyager for its first outside flights on the following morning. Since I already had it hovering nicely, I started to push the flight envelope. The Voyager handled much like a .30-size heli, and its reaction to the cyclic controls was surprisingly responsive. Forward flight was easy, and the model displayed a good climb rate.

I flew several circuits and figure-8s and was very impressed by the model's qualities. I kept pushing it to faster and faster forward flight and attempted hard left and right turns; the Voyager handled them all well, and it didn't display any pitching tendencies.

Next, I tried some autorotations and found that, despite the lightness of the main blades, I could indeed do them.

Several of these outdoor flights were made in less than ideal conditions; the Voyager E was able to handle wind that exceeded 10mph. Though it has all the right attributes for aerobatics, I have not yet attempted any because of the weather.

I have flown the Voyager at several indoor demonstrations, and it has always performed well and impressed audiences.



Left and below: everything is well-organized and straightforward. The motor and battery pack are easy to get to.

pushrod and adjusted the pushrod guides to ensure zero resistance.

If you aren't familiar with CCPM, you'll appreciate that the manual goes to great lengths to explain, in very simple terms, how it works. The manual also shows how to set up JR radios (XP652, XP8103DT, 10X) that have CCPM mixing programs. If you have an older model (JR X347, X388S etc.), send it to Horizon's service center to have the CCPM mixing activated. If you use a radio other than a JR, consult its manual for CCPM details.

Because I used a JR 10X radio, I followed the manual's step-by-step instructions, and it couldn't have been easier. All the values, such as CCPM activation, servo-reversing and travel adjustments, are clearly explained. Different values are also given to suit digital and standard servos.

I connected the servos to the receiver and centered them. If you use JR servos, the manual recommends that you use JRPA215 heavy-duty servo arms. The use of these arms produces a 20mm gap between the pushrods and the swashplate. If the gap is not 20mm, you'll have unwanted control differential and interaction.

Following the manual, I attached the servo pushrods to the swashplate. There is a misprint in step 5-3 of the manual; it states that pushrod "A" should be 65mm long, but it should in fact measure only 35mm.

I set up the ESC, punched in the values for the pitch/throttle curves on the radio and balanced the finished main blades (which were very closely matched).

Finally, I trimmed and decorated the canopy. The Voyager E's canopy is small and attractive but requires a lot of trimming; but the result is great.

CONCLUSION

The JR Voyager E was easy to assemble and set up, and it's fun to fly; it attracts a lot of attention wherever I take it. Its mechanics are simple and strong, yet very light, considering its size. The instruction manual is clear and concise.

The Voyager E's flight performance resembles that of a .30-size glow heli, and although its flights tend to be shorter, its performance more than compensates.

JR, *4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; www.horizonhobby.com.*
Horizon Hobby Inc., *4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; www.horizonhobby.com.*

MODEL AIRPLANE NEWS
FIELD & BENCH
REVIEW

PHOTOS BY JIM CHERRY

WORLD MODELS

P-82 Twin Mustang

Twice the power–twice the fun

by Jim Onorato

World Models Mfg. Co., Ltd. makes a number of high-quality, almost-ready-to-fly airplanes. Perhaps the most unique is the P-82 Mustang, better known as the "Twin Mustang." A 90-percent complete, precision-built kit, the World Models' P-82 blends innovation with quality craftsmanship in an easily assembled ARF that is a must-have in any modeler's collection. It doubles the excitement of an American aviation classic and promises to thrill you with its performance just as it does in its conception. World Models kits are exclusively distributed in the U.S. by AirBorne Models.

WHAT'S IN THE BOX

It is apparent when you open the box that this is a well-made "kit." Each of the major pieces is enclosed in a separate plastic bag. The fuselages are constructed of balsa and lite-ply and come fully sheeted, the wing and elevator are built up and the tail feathers, except for the elevator, are solid sheet balsa. The entire plane is nicely covered with colored aluminum Oracover.

This kit includes everything you need except the engines, props and radio. It comes with installed retracts, hinged control surfaces and a functional split flap. It also includes painted fiberglass cowls, fiberglass radiator scoops, adjustable engine mounts, fuel tanks, spinners, tailwheels, painted pilot figures, a decal sheet and a complete hardware package. A transparent dummy cowl makes it easier to trim the fiberglass cowls around the engines.

The P-82 is designed to be powered by two .32 to .40ci 2-strokes or two .40ci 4-strokes. I've seen this plane fly with two .40 2-strokes, and I would not recommend anything larger. I used two MDS .38s, and they provided more than enough power.

The plane requires a 6-channel radio, nine servos and a whole bunch of extensions and Y-harnesses. It is clear from the 11-page instruction booklet that this plane is not intended for inexperienced builders. The booklet consists of just 23 drawings and symbols with almost no written instructions. As with most ARFs, a plan is not necessary and is not included.

ASSEMBLY

You begin with the wing—the most complex part of the plane. It has retracts, ailerons and a split flap, and it requires four servos and a mess of wires and connectors. The wing comes in three sections. Each outer section contains an aileron and an aileron servo, and the center section contains the retracts, retract servo, split flap and flap servo. Because

Straight out of the box the mustang has many prebuilt parts.

SPECIFICATIONS

Model: P-82 Twin Mustang ARF

Manufacturer: World Models Mfg., Ltd.

Distributed by: AirBorne Models

Type: scale ARF warbird

Wingspan: 70.6 in.

Wing area: 734 sq. in.

Airfoil: semisymmetrical

Weight: 9.5 lb.

Wing loading: 31.2 oz./sq. ft.

Length: 49 in.

Radio: 6-channel w/9 servos

Engines req'd: two 2-stroke 0.32 to .40ci or two 4-stroke 0.40ci

Engines used: two MDS.38 2-strokes

Retail price: $329.99

Features: 90-percent complete ARF. Balsa-wood construction with Oracover iron-on film covering. Painted fiberglass cowl and radiator scoops. Transparent dummy cowl to assist engine installation. Balsa-sheeted built-up wing with semisymmetrical airfoil. Installed retracts and split flap. Kit includes all the necessary hardware, spinners, fuel tanks, wheels and pilot figures.

Hits

- Excellent flight performance.
- Good overall appearance.
- High-quality, painted, one-piece fiberglass cowls and radiator scoops.
- Precise engineering for easy assembly.
- All hardware included.

Misses

- Weak retract mounts.

The wing center section comes complete with retracts and flaps.

the ailerons and retracts are installed, I simply removed the covering material from the servo bays and glued the hinges for the split flap. I regret that I did not remove the retracts to check their mounts because they later ripped out on what I thought was a smooth landing. The mounting plates are 1/4-inch lite-ply and are partially cut away to make room for the coil on the landing gear strut. They are susceptible to breakage whenever rearward force is applied to the gear—such as in landing. After mine ripped out, I replaced the mounts with wider ones that extended back to the spar, and I added a reinforcing block where the mounts were glued to the ribs. I strongly recommend that you remove the landing gear and reinforce the mounts before the first flight. At the very least, add a couple of pieces of spruce triangle stock between the mounting plates and the ribs. Trust me; this is a lot easier than rebuilding the mounts later.

Once you have mounted the aileron and flap servos on their sides and attached them to the two mounting blocks, epoxy the blocks to the servo-bay covers. I discarded the balsa mounting blocks and replaced them with hardwood blocks. I attached the servo-bay covers to the wing with four sheet-metal screws then installed the retract servo. A colored-aluminum plastic plate covers the retract servo, which you also secure with four sheet-metal screws. The retract servo bay is not very deep, so it requires a low-profile retract servo.

The P-82 kit comes with unique control horns. They consist of a 3mm machine bolt molded into a triangular plastic base. The pushrod clevis is attached to a plastic fitting which is then threaded onto the bolt, so the length of the control horn can be adjusted. You attach the control horns to the control surfaces with three self-tapping bolts that thread into matching triangular backing plates. There are three short ones for the ailerons and flap and three longer ones for the rudders and elevator.

Before you join the wing panels, decide which radio components will go into which fuselage so that the necessary Y-harnesses and extensions can be routed through the wing. I placed a rudder servo and a throttle servo in the left fuse and rudder, and throttle and elevator servos in the right fuse along with the receiver and the battery pack. The instructions show the receiver and battery pack in the left fuse, but that arrangement requires an extra servo extension for the elevator servo.

After I joined the outer panels to the center section with an aluminum-tube wing joiner and installed locater pins, I secured everything together with two bolts and epoxy.

Top: the radio tray is ready for servo installation. Since there are two fuselages theres plenty of room for equipment. Right: the rudders and elevators come hinged.

FLIGHT PERFORMANCE

The first flight with an airplane is usually nerve-racking, but I had seen someone else fly a World Models P-82, so I knew it would be fine as long as the engines ran well. To be safe, I installed the two MDS .38s in another twin-engine model and made sure they were well broken in before I tried them in the P-82. I then checked out the control-surface throws and the CG on the P-82 and went through my usual twin-engine startup procedure. I started the left engine, tuned it in and shut it down; then I did the same with the right engine. After topping off the two tanks, I fired up both engines and was ready to go. The sound of those twin engines was awesome!

• TAKEOFF AND LANDING

With its small wheels on our grass field, the P-82 had a tendency to nose over while taxiing. To solve this problem, my good friend Bob Van Tassel held the plane until I ran the engines up to speed, then he let it go. I applied some up-elevator to keep the tail down, and the plane accelerated quickly on a straight track across the grass field. As it gained flying speed, I gradually reduced the up-elevator to let the tail lift, and it was soon airborne and climbing nicely.

With a wing loading of 31.2 ounces per square foot., the P-82 is not a floater, but it does have a reasonably shallow "glide" angle when the engines are idling. (I have never had it in a true glide.) This allows for rather routine landings as long as you maintain airspeed. My first landing ripped out the landing gear, but after I strengthened it, subsequent landings were fine. The split flap didn't have much effect on landing speed.

• LOW-SPEED PERFORMANCE

The plane flies nicely at low speed and responds well to the controls. On one flight, it stalled very gently as the right wing dropped slightly before the nose dropped, but recovery was quick. Low, slow banking turns in front of the photographer were no problem at all, and the P-82 soon looked like a P-38 without the center pod.

• HIGH-SPEED PERFORMANCE

The P-82 flies very fast and scale-like with the wheels tucked up and the twin engines at full throttle. I didn't experience any bad tendencies at high speed and was impressed with how well the plane tracked. It is a thing of beauty in the air, and watching it pass at high speed 30 feet above the field really got my adrenaline pumping. The MDS .38 engines provide plenty of power and proved to be a great choice for the P-82.

• AEROBATICS

I doubt anyone would purchase a P-82 to perform aerobatics. However, this plane does beautiful, large, round loops and great axial rolls. It also does neat-looking stall turns and flies well inverted. I really enjoy flying this airplane!

When I completed the wing, I began work on the fuselages. I installed the fins, rudders and tailwheels on the two fuselages, then assembled and installed the fuel tanks. Next, I bolted the adjustable engine mounts onto the firewalls and installed the engines in the upright position. The blind nuts for the mounting bolts were already installed in the firewalls. Then, I used the transparent dummy cowl to trim the fiberglass cowls around the engines and attached the finished cowls with four sheet-metal screws.

Installing the solid wire rudder and elevator pushrods into the installed, plastic outer tubes was easy. Each of the fuselages includes two installed outer tubes, but I did not use the elevator tube in the right fuse. You need to install the left throttle pushrod tubes, however, because their locations depend on the engine you decide to use. The fuselages also come with pilot figures and canopies.

The next step is to fit the stabilizer between the two fins and secure it with four bolts that thread into installed fittings in the stab. Do not install the stab until you have firmly attached the fuselages to the wing. To make final assembly (and field assembly) easier, I made a Styrofoam cradle to hold the fuselages parallel and at the proper distance from one another. I then placed the fuselages upside-down in the cradle and attached the wing, air scoops, the stab and the elevator pushrod.

Top: to simplify fuselage construction, the air scoops are made as separate pieces and are screwed into place. Right: the cowl comes painted and ready to install.

The plane's configuration requires three Y-harnesses for the rudder, throttle and aileron servos. In addition, the connections between the fuselages require several extensions. To simplify things and make sure everything gets hooked up properly, I labeled all of the connectors.

The World Models Mfg. P-82 Mustang is a well-made ARF that is easy to assemble and looks great when complete. If you are looking for a rather unusual "twin" but don't want to spend a lot of time building one from a kit, this plane may be just what you're looking for. I guarantee that fellow pilots will notice it at the flying field!

AirBorne Models, 2127-H S. Vasco Rd., Livermore, CA 94550; (925) 371-0922; fax (925) 371-0923.

Pattern flying by the numbers—easy as 1, 2, 3!

MRC/ALTECH

EZ Stingray ARF

by Jim Onorato

The EZ Stingray ARF is one of several in OK Model Co.'s popular line of ARF RC aircraft making its triumphant return to the U.S. market. These kits, known for their excellent flight characteristics, come 90 percent complete and feature a patented laminated skin over an inner wooden structure. The laminated skin consists of a plastic foam base, followed by a synthetic paper layer with the graphics printed on it and, finally, a layer of clear Mylar to protect the surface from fuel and cleaning products. This method of construction creates some very impressive graphics and results in extremely lightweight, excellent flying models.

Like the other EZ ARFs, the Stingray features bright, colorful graphics, easy-to-follow instructions and nearly everything you need to get your plane into the air.

SPECIFICATIONS

Name: EZ Stingray

Manufacturer: OK Model Co. Ltd.

Distributor: MRC/Altech Marketing

Type: aerobatic pattern ARF

Wingspan: 52.4 in.

Wing area: 530 sq. in.

Airfoil: symmetrical

Weight: 5 lb., 8 oz.

Wing loading: 23.9 oz./sq. ft.

Length: 50.6 in.

Radio: 4-channel (throttle, elevator, aileron, rudder)

Engine recommended: .40 to .45 2-stroke or .50 to .70 4-stroke

Engine used: Enya 50CX 2-stroke

Street price: $269

Features: aerobatic ARF with triple-layer outer skin over inner wood frame; plastic cowl and clear molded canopy; all necessary hardware, including spinner, fuel tank, wheels and pilot figure, is provided.

Hits

- Excellent flight performance.
- Parts fit well.
- Easy assembly.
- Kit is complete.

Misses

- Weak plastic clevises.

THE KIT

My first impression when I opened the box can be expressed in one word: "Wow." The Stingray is finished in metallic chrome, red and blue with white control surfaces. The graphics are typical "EZ" in that they are bright and colorful, and the chrome really stands out! The word "kit" is not quite appropriate when talking about ARFs, since you don't really build them; you just assemble them. This one is no different. Everything you need to get flying is included, except the radio, engine, fuel tubing and

The colorful graphics and bright metallic chrome contribute to the Stingray's striking appeal.

propeller. Even a pilot figure is included! Control horns, clevises and other plastic parts are packaged on a molded "tree." Ailerons are already hinged and glued with very little gap. A fuel tank, plastic cowl, wheels, engine mount, spinner, pushrods, tinted canopy, pilot and complete hardware package (with metric nuts and bolts) are all included.

A 23-page instruction booklet guides you through assembly, eliminating the need for a full-size plan. The booklet is filled with excellent photos and adequate instructions in both English and Japanese. All dimensions are given in millimeters, which you can easily convert to inches by dividing by 25.4.

The EZ Stingray comes nearly 90 percent assembled right out of the box and includes ailerons, a fuel tank, plastic cowl, wheels, engine mount, spinner, pushrods, a tinted canopy, pilot and a complete hardware package.

FLIGHT PERFORMANCE

The first flights of the Stingray took place on a sunny fall day with very little wind. I used the recommended throws for high rate and set the low rates at 60 percent. The initial flight was at low rate.

• TAKEOFF AND LANDING

I pointed the Stingray into what little wind there was and slowly advanced the throttle. The plane tracked nicely with just a slight tendency to turn left. A bit of right rudder straightened it out. When flying speed was attained, just a touch of up-elevator was needed to get the Stingray to lift smoothly into the air. Once in the air, a touch of down-trim made it fly straight and level.

The Stingray has a very shallow glide slope, which makes landings a real pleasure. I set up a long approach and throttled down to establish the rate of descent. While maintaining a nose-high attitude, I used slight up-elevator to bleed off some airspeed. As soon as the main gear touched down, I chopped the throttle and let the plane settle onto its nose gear.

• LOW-SPEED PERFORMANCE

The Stingray handled very well at all speeds. When I forced a stall at a safe altitude, the tail dropped slightly and the plane just continued to fly. When it finally stalled, the stall was gentle and nearly straight ahead.

• HIGH-SPEED PERFORMANCE

The Stingray flew really fast at full throttle and was very responsive to control inputs. The only problem that I noticed at high speeds was a slight tendency to roll out of full-up loops. The Enya 50CX provided more than enough power, taking it straight up without much effort. The Stingray's tracking made me feel as though I was flying a much larger airplane.

• AEROBATICS

The Stingray is marketed as an aerobatic pattern model, and I was eager to see what it could do. I was not disappointed! I was pleasantly surprised at just how good this plane made me look. It performs graceful, large loops without losing heading, and its high-speed rolls are perfectly axial. With aileron throw at high rate, the rolls are so quick I wouldn't have time for elevator correction even if it were needed. Four-point rolls and snap rolls are very crisp. Inverted flight requires just a hint of down-elevator to maintain altitude. Sustained knife-edge is a breeze, as are outside knife-edge circles. Spins are fine, and recovery is immediate.

ASSEMBLY

The Stingray wing comes in halves and requires a single servo for the strip ailerons. The aileron pushrods are made of 1.8mm music wire threaded on one end. I used L-bends with snapper-keepers at the servo ends rather than making Z-bends, as called for. I did not use the plastic clevises supplied with the kit; I found them to be flimsy and difficult to keep closed. [Editor's note: all future kits will come with improved hardware.]

Join the wing halves using 30-minute epoxy on the center ribs and on the laminated lite-ply and balsa wing joiner. The lite-ply center ribs have a tab on them that locks the wing's leading edge into the fuselage. The wing joiner fits snugly into the wing-joiner pockets. The instructions call for 5mm dihedral at each tip. I just made sure the root ribs were glued tightly together—without gaps—and left the dihedral to chance. When the epoxy had cured, it looked pretty good. I taped the plastic top, center wing cover in place and glued it with thin CA at the edges. Be very careful when you use CA on this model; it will dissolve any exposed foam.

I made the wing bolt mounting plate from three die-cut pieces of lite-ply, which I laminated with medium CA. I installed blind nuts and epoxied the block into the fuselage. After making sure the wing was perfectly aligned to the fuselage, I drilled out the holes for the mounting bolts, added the lite-ply reinforcing plate and attached the wing with two 4mm steel bolts. The joint between the wing saddle and the wing was perfect! I then attached the plastic wing bottom cover with thin CA and cut holes for access to the wing-mounting bolts.

The firewall comes predrilled for the radial engine mount. Blind nuts are already installed.

Because I fly off a grass runway, I decided to install an Enya 50CX engine. Unless you always take off from a paved runway, I strongly recommend that you use something larger than a sport 40 in the Stingray!

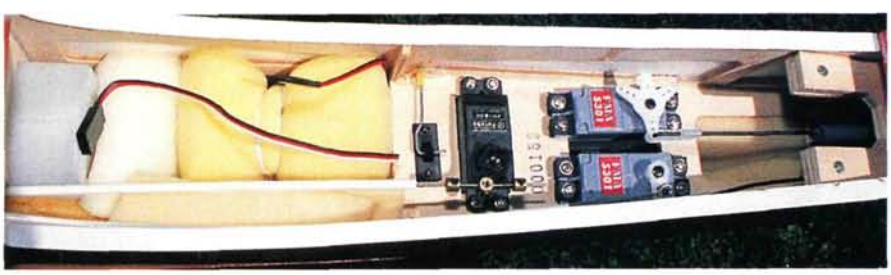
I attached the radial metal engine mount with adjustable metal plates to the firewall with 3mm bolts and blind nuts that were already installed. I then placed the engine on the mount at the prescribed distance from the firewall (4¾ inch) and drilled the plates to match my engine. I mounted the engine onto the firewall with the cylinder head at "10 o'clock" to ensure that the muffler cleared the cowl.

Next, I assembled and installed the fuel-tank fittings. The tank fit nicely in the fuselage former, with the pickup and vent tubes protruding through the firewall.

I attached the nose gear to the mount, which was already installed on the firewall. I installed the main gear in the wing with nylon landing-gear straps and sheet-metal screws.

The Stingray comes with three 50mm (approximately 2-inch) sponge-rubber wheels. These turned out to be too small for the grass runway I use, so I replaced them with 2½-inch wheels.

I mounted three standard servos on the facto-



The three standard servos fit easily into the factory-installed servo tray. Though the plans called for Z-bends, I used L-bends with snapper-keepers to attach the control rods to the servos.

EZ STINGRAY ARF

ry-installed servo tray and assembled the rudder and elevator linkage rods per the instructions. All of the necessary hardware was included in the kit. The elevator pushrod has two threaded wires on the control-surface end, one for each elevator half. Because the wire on the servo end of each pushrod is unthreaded, I used L-bends with snapper-keepers, though the plans called for Z-bends. The throttle and nosewheel pushrods are solid wires in plastic tubes.

I removed the covering where the control horns are attached to the elevators and rudder and replaced it with die-cut lite-ply pieces. I then applied aluminum "stickers" over the lite-ply. Hinge points are already installed on the elevator and rudder and glued on one surface. I epoxied the elevator hinge points to the stab, after I applied petroleum jelly to the pins to prevent

The plastic pilot figure included in the kit looks pretty "cool." Because I desired a little extra power, I installed an Enya .50CX engine.

the epoxy from sticking to them. Next, I epoxied the fin to the stab using the plastic root cover as a jig to make sure the fin was positioned properly. Then I glued both to the fuselage and attached the rudder. Last, I attached the cowl to the firewall with four sheet-metal screws.

The final steps included the application of decals and the installation of the pilot figure and canopy. The pilot figure is made of really thin plastic, and it was a bit of a job getting the head together; after I had painted it, however, he looked pretty cool with his shades and '50s-style hairdo.

CONCLUSION

The Stingray proved to be a well-made ARF that went together easily and had a very slick appearance when completed. If you want to get into the air quickly to practice all of your pattern maneuvers, then OK Model Co.'s Stingray fills the bill. This Stingray has excellent flight characteristics and makes pattern flying EZ!

MRC/Altech Marketing, *P.O. Box 7182, Edison, NJ 08818-7182; (732) 225-6144; fax (732) 225-0091; www.modelrec.com.*

The best keep getting better ...

FLORIDA JETS

PHOTOS BY RICH URAVI

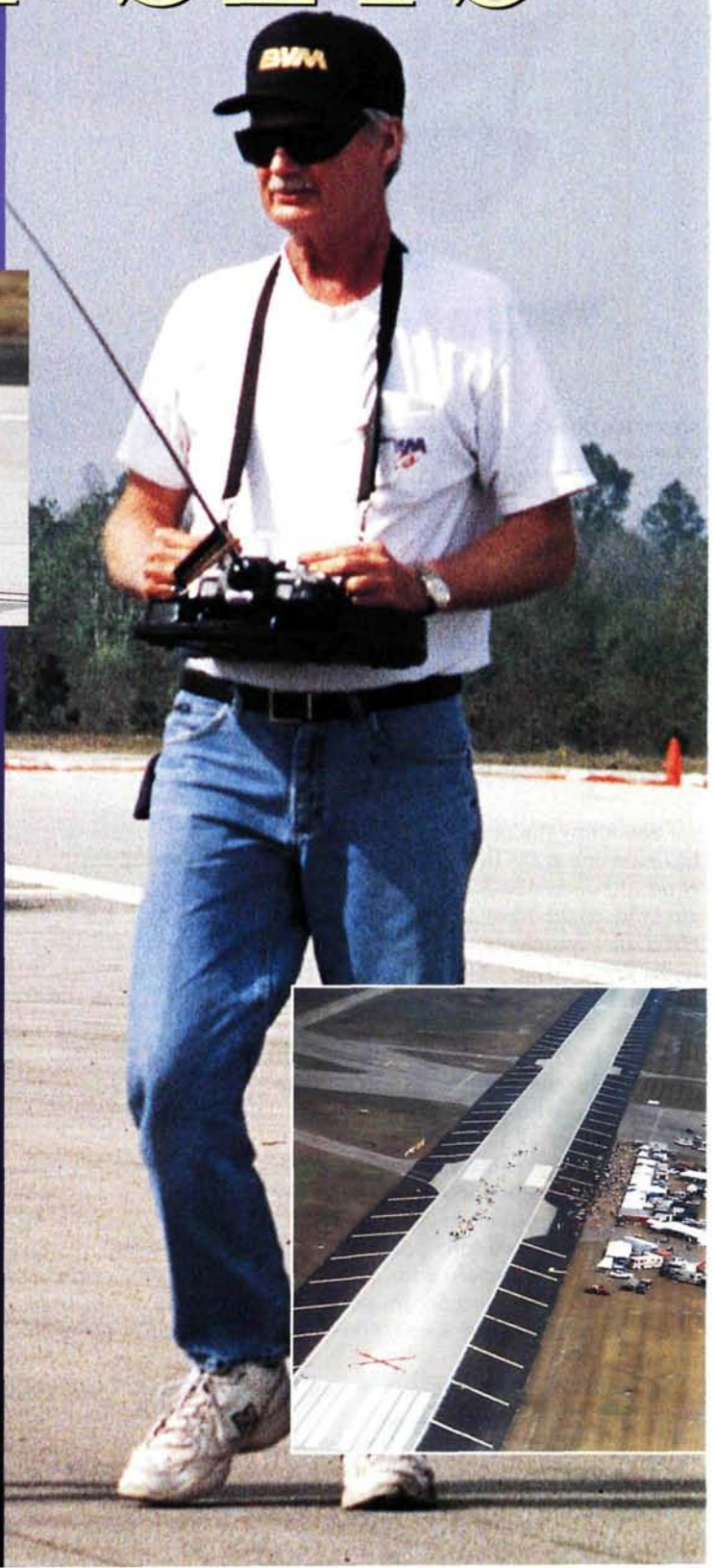
by Rich Uravitch

Florida Jets 2001 provided a showcase for some of the hottest and most exciting flying machines ever seen! If you had to sum up the fourth year of this annual jet-modeling extravaganza in one word, it would have to be "turbine." Plain and simple, this form of

Wing commander, Arctic-scheme finished F-80 Shooting Star was an outstanding example built from the BVM kit by Dan Avila. "Best Military Jet, pre-1960" award recipient.

jet propulsion has clearly outdistanced the ducted fan we've come to know over the past 20 years or so. Of the 294 jet models on hand at the meet, we saw fewer than a dozen powered by ducted fans. It was, however, pretty easy to keep track of the ducted-fan flights; the sound got your attention! What used to be the auditory norm was now rare and, when a ducted fan spooled up, most folks noticed!

RAM head man Rei Gonzalez (left) about to fire up his RAM 500-powered BVM F-86. The 500 will probably prove to be the most popular small turbine available, as it lends itself well to installation in earlier DF airframes.



Pat McCurry has formed the PCM company to produce fiberglass kits of his outstanding Lockheed L-1011 for single-turbine operation. It's nice to see commercial jet subjects becoming available.

This F-4J taxiing back to the shutdown area is Bob Violett's (left) personal show machine. It features Blue Angel markings, is smoke equipped, weighs 25 pounds and is AMT Pegasus-powered.

NOTAR helicopter view of the Florida Jets flying site. Great facility; outstanding event.

FLORIDA JETS

Last year, I asked, "Is there an obvious reason for this upstart RC propulsion system to experience such an incredible level of immediate acceptance?" Whether it's due to increased levels of "disposable income," the never-ending desire to trade up, or the "gotta have it at any cost" attitude of jet modelers, turbines continue to grow in popularity and are obviously here to stay. Their future looks brighter than ever. Their rapid growth far exceeds that of their ducted-fan cousins over a similar period. Part of their mystique is that they offer the only way to simulate the performance, sound and appeal of jet aircraft.

Bob Violett getting his Hun ready for one of many sorties. This bird looks great from any angle!

Eddie Weeks' video camera-equipped DC-10 on a fly-by. Eddie built two of these monsters, one FedEx and the other UPS. The mostly carved foam structure is powered by a pair of turbines.

The flying site is the Flagler County airport in Bunnell, FL, just north of Daytona. Event promoter Frank Tiano put together one of the most smoothly run events ever. Unfortunately, he couldn't control the weather. On Thursday and Friday, conditions were exceptional: temperatures in the high 70s, blue skies and a gentle breeze right down the runway. Saturday started the same way, but by late afternoon, that wind down the runway had become rather brisk! It was all downhill from there: the skies darkened and torrential rain squalls arrived and lingered through Sunday morning. It got so bad that everyone packed up and headed home early. In spite of this, more than 170 registered fliers logged 630 sorties! That's a bunch of JP-4 and glow fuel being burned!

FOR YOUR ENJOYMENT

More than 1,800 spectators enjoyed seeing some truly interesting models and exciting flying performances.

A very pretty Czech L-39 Albatross. This is a great scale subject; it's nice to see such a well-done example.

Eddie Weeks returned with his giant DC-10 in FedEx markings; it got everyone's attention wherever it was parked and whenever it flew! Not one to sit on his laurels, Eddie produced a second behemoth DC-10, this one in UPS markings. Imagine transporting two of these monsters! Eddie carved these "civvy" jets out of foam blocks, hollowing them out where necessary and installing radio gear and a pair of turbines. The models flew really well; in fact, Eddie provided stick time to some lucky fliers who expressed an interest. The long slow rolls and loops might have been a little out of character, but they sure were impressive! The big FedEx DC-10 was also equipped with a pair of video cameras, one shooting forward, the other aft. Scott Stauffer of SKS Video supervised the installation and will, no doubt, include some of the footage in his jet video productions. Argentinean Gustavo Campana, along with the Pulqui Hobbies team, followed up last year's beautiful Mirage 2000 from the Eric Rantet kit with a brand-new Aviation Design F-16 powered by a RAM 1000 turbine. The highly visible and attractive European Tiger Meet scheme earned Gustavo the "Critic's Choice, Turbine" award for his efforts. A new "sport" turbine model introduced by Bob Violett Models (BVM), appropriately named the "Bobcat," offers a highly prefabricated, twin-

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Best Military Performance, Ducted Fan	Dave Malchione	F-4J	Mini-Hobby
Best Military Performance, Turbine	Vern Montgomery	F-4E	JR Radios
Best Military Jet, pre-1960	Dan Avila	F-80	RC Jets Intl.
Best Military Jet, post-1960	Bob Violett	F-100	AMT
Best Sport Jet	Vern Kramer	Bandit	PCM Models
Best Civilian Jet	Pat McCurry	L-1011	Century Jet
Best Multi-Engine Performance	Jack Diaz Sr.	Dassault Rafale	RA Microjet
Critic's Choice, Ducted Fan	Bryce Watson	BaE 146	Model Airplane News
Critic's Choice, Turbine	Gustavo Campana	F-16	ZAP Gang

Jack Diaz surveys his F-4. The feeder tank on the right-hand wing is used during run-up and taxi to conserve the onboard fuel supply and allow the accurate timing of flight on internal fuel.

Kent Nogy's ultra-slick-looking Bandit. This beautifully finished model is fitted with external fuel tanks.

boom airframe designed for the newcomer. It has the general appearance of the highly successful Graupner and FiberClassics Kangaroo and Hot Spot turbine-powered sport models but with more of a "Bandit with booms" look. The two imports are twin-fin deltas with absolutely simple turbine installations in which the powerplant is mounted externally near the aft portion of the fuselage. The turbine is completely in the airstream on the Kangaroo and is partially hidden on the Hot Spot.

The folks at RA Microjet had everyone buzzing with their new RAM 500 installed in a BVM F-86, which seemed to be constantly airborne. The 500 is the newest and smallest unit available, and it will surely draw more jet enthusiasts into the turbine fold. Its size makes it a natural for converting some of the earlier, smaller airframes originally designed for ducted-fan operation.

No question about it, turbines have ushered in a great new market for kit manufacturers. Another great-looking sport jet is the Raptor/Razor series from CAI. This highly prefabricated jet is sold as a complete kit to which you add radio and turbine. I'm told that there is minimal work involved in assembly, so you get in the air more quickly. About all that's left is the finishing, and that's when the model can be made to look exceptional, as was the case with Lewis Patton's Navy-scheme version, which was frequently airborne.

FROM HERE TO WHERE?

I mentioned last year that some participants suggested we were probably witnessing the disappearance of ducted fans as a viable propulsion system for jet models. I disagreed with that position then, and still do, for a number of reasons. If Florida Jets is a credible barometer, more and more modelers are switching to turbines and selling their ducted-fan equipment to finance the transition. That means there could be a lot of proven, used fan/engine packages available at good prices. Think about it: if you, as a sport flier, were really excited by jets and had an opportunity to buy someone's used, proven ducted-fan equipment at a very attractive price, wouldn't you consider it? Sure, you would. After all, the biggest deterrent to trying anything new is the cost of admission, isn't it? Another factor fueling jet modeling growth is the arrival of electric-powered ducted-fan models that perform extremely well. A great example of this new and exciting form of jet propulsion is Bryce Watson's four-motor BaE 146. It is mostly molded foam, assembled from the Robbe kit and impressive enough to fly away with the "Critic's Choice, Ducted Fan" award! If we view RC jet activity as an expanding hobby and avoid making distinctions between ducted-fans (glow or electric) and turbines, everyone is likely to benefit.

One of my favorites and, I hope, an example of things to come was this BaE 146 flown by Bryce Watson. A Robbe kit and four Rojet electric fan units launched its 10-pound weight. Despite the wind, it performed well.

Turbine guys seem to be more interested in flying than designing and building, so as I've said before, we're seeing more and more highly prefabricated, composite airframes available from more and more sources. This trend seems to parallel trends we're seeing in other areas of RC: the almost-ready-to-fly models (ARFs) make it easy to get involved, but the resultant "sameness" takes away some of the excitement. We're seeing less of the very creative model design and building that many of us saw in the early days of the jet movement. It would be really nice to see a flightline with some unique, scratch-built designs. Maybe there are some enthusiasts among the new breed of jet modelers who will take it to the next step once again!

Florida Jets 2001 was the most impressive meet I've been to recently. It was well run, well attended and very well "spectated." Plans for Florida Jets 2002 are already under way; if you want to get the real scoop on jets, be sure to attend next year, February 21 through 24, 2002 (for details, check out Frank Tiano's website, www.franktiano.com). Give jets a try; the timing couldn't be better!

Aveox Electric Flight Systems, *31324 Via Colinas, #103, Westlake Village, CA 91362; (818) 597-8915; fax (818) 597-0617.*
Aviation Design, *2, rue de la Plaine, Jonville 77310, Ponthierry, France; 011-33-160-65-7861.*
AMT, *Rt. 2, Box 154A, Williamstown, WV 26187; (304) 375-3777; fax (304) 375-6362.*
Bob Violett Models (BVM), *170 State Rd. 419, Winter Springs, FL 32708; (407) 327-6333; fax (407) 327-5020; bvmjets.com.*
CAI/Crow Aviation Inc., *6141 Crestmount Dr., Baton Rouge, LA 70809; (225) 214-1090; fax (225) 214-1092; razor@crowaviation.com; www.crowaviation.com.*
Century Jet Models, *11216 Bluegrass Pky., Louisville, KY 40299; (502) 266-9234; fax (502) 266-9244; www.centuryjet.com.*
FiberClassics; *distributed by Planes Plus Inc.*
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JR, *4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; www.horizonhobby.com.*
PCM, *2134 Polo Gardens Dr., #202, Wellington, FL 33414; www.flypcm.com.*
Planes Plus Inc., *5 South 470-B Scots Dr., Naperville, IL 60563; (708) 416-6940; fax (708) 416-0027.*
Robbe Model Sport; *distributed by Aveox Electric Flight Systems.*
RA Microjets (RAM), *8222 NW South River Dr., Medley, FL 33166; (305) 863-1970; fax (305) 863-1971.*
SKS Video Productions, *85 Pine Rd., Abbottstown, PA 17301; (800) 988-6488; fax (717) 259-6379; www.sksvideo.com.*
SWB Turbines, *1120 Meadowview Dr., Manasha, WI 54952; (414) 725-9562.*
Zap Glue, *9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.*

IMAC Aerobatics

by Dan Wolanski

Flying the torque roll

A master of the freestyle torque roll maneuver is Frank Knoll, seen here during the halftime show at the Heart of Ohio Jet Scramble. Don't do your maneuvers this low! Start at about 100 feet altitude.

The torque roll is probably the single most impressive freestyle maneuver you can perform; it is also the most difficult to master. A torque roll requires that the aircraft, in a nose-up attitude, balance its weight with the propeller thrust while it slowly rotates about its roll axis. The airplane rolls in reaction to the engine's torque.

Torque rolls are even more impressive when executed close to the ground. During the last few years, this freestyle maneuver has been aided by the use of gyros. Gyros greatly help in maintaining a perfect nose-up attitude. But if you ever want to enter a freestyle competition such as one sanctioned by IMAC (International Miniature Aerobatic Club), you will need to master the maneuver without the aid of a gyro. There are several tricks to performing a torque roll correctly:

■ **Setup.** Proper setup is essential. First, be sure your control surfaces are capable of 3D throws. Set up your rudder and elevators for at least 45 degrees of deflection. You will rarely need this much deflection, but when you do, you will need a lot of it. Quicker servos also help, since the faster you can input the correction, the less correction you will need. I use the Futaba 9402 servos, which provide lightning speed (0.09 second/60 degrees) while producing 111 oz.-in. of torque. Also make sure that your aircraft is not nose-heavy; a tail-heavy airplane will torque roll significantly more easily than a nose-heavy one. (Insider tip: many of the Tournament of Champion pilots add several pounds of weight to their planes' tails for freestyle events.) A good indicator that your model is tail-heavy is that when you roll it inverted during straight and level flight, it requires little or no down-elevator to maintain level flight.

Finally, you will need a large, light prop that will spool up very quickly and generate a lot of thrust. I use a Menz 32x10 wooden prop on my Desert Aircraft 150cc engine. This combination gives instant throttle response with enough torque to yank my 36-pound plane around like a yo-yo.

■ **Engine.** You must have a reliable engine that is capable of instant throttle response. One little miss from your engine can spell disaster if you are close to the ground. Be sure your low-end idle is set up properly and gives immediate transition response. To perform low torque rolls, use the best fuel and engine you can afford.

■ **Flying the maneuver.** The key to doing a torque roll properly is a good entry. It really doesn't matter whether you enter it upwind or downwind, but a torque roll is very difficult to perform in wind of more than 10mph. Your goal should be to

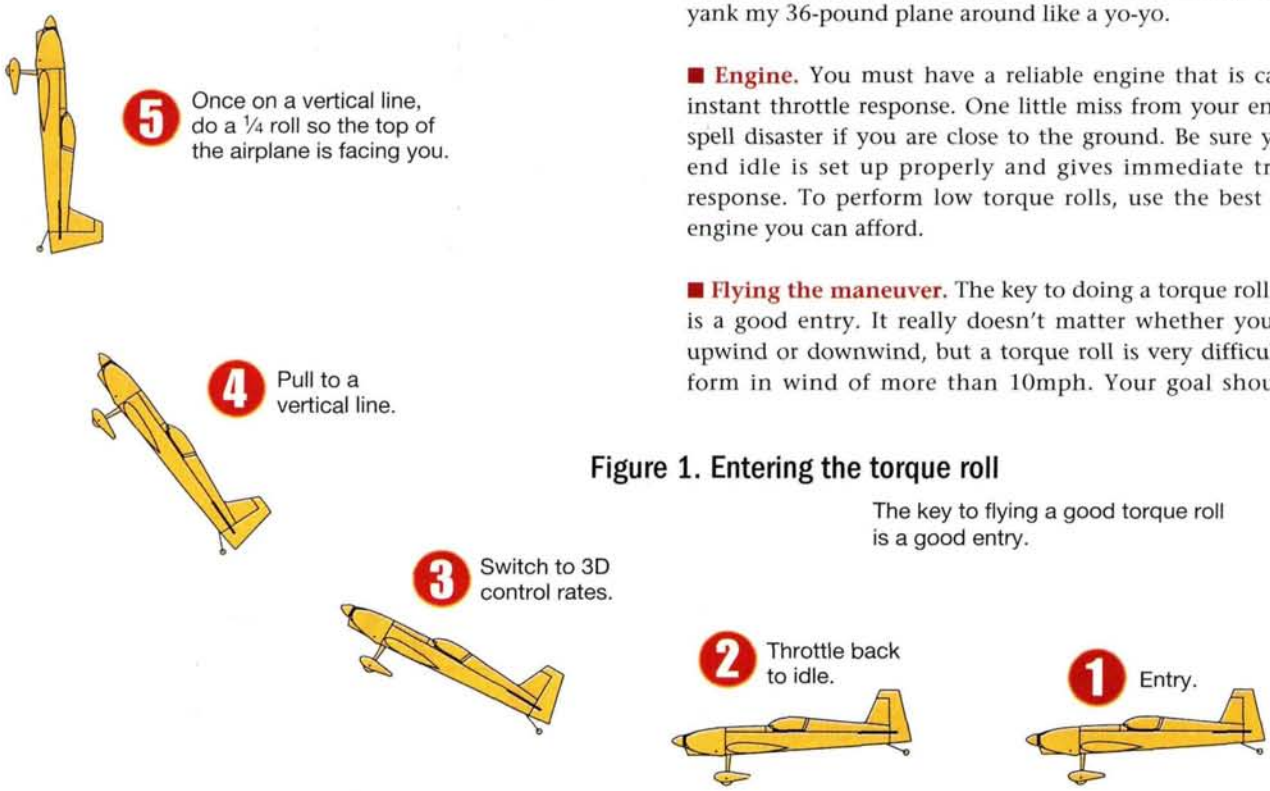


Figure 1. Entering the torque roll

The key to flying a good torque roll is a good entry.

enter the maneuver with the model in front of you, at a comfortable height and in a perfectly vertical attitude. For your first time, start with an entry that is at about 100 feet high. Throttle back to idle to bleed off speed, switch your transmitter to the 3D control rates, and point the plane straight up. Now do a ¼-roll, so that you see the top of the plane. Seeing the top of the plane will help you sort out the initial inputs. (Hint: a common mistake is not getting the plane perfectly vertical; it should look as if its nose is pitched backward slightly toward the canopy).

Now, while pointing straight upward, let the plane come to a complete stop with the engine at idle, and begin to advance the throttle but not enough to gain altitude; in fact, you want the plane to slip backward ever so slightly. Once you are very close to equilibrium (where the thrust equals the model's weight), "rock the throttle," i.e., rev the throttle back and forth a few clicks around the point of equilibrium. The plane should then begin to rotate. If it doesn't, it isn't completely vertical. Once the plane does begin to rotate, you will need to be on top of every little correction.

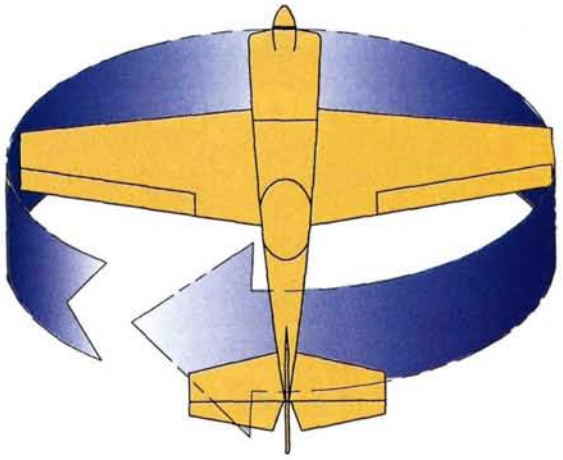
During the torque roll, corrections should be made only with the elevator and rudder. Try to time your inputs for when your engine is at maximum rpm during your throttle "rocking." You will not need any aileron to get the plane to roll. You will need an almost instant reflex to make elevator and rudder inputs in every direction. If everything looks as if it is going perfectly, it isn't! Don't stop adding inputs or your model will fall out of the maneuver; in fact, a perfect torque roll requires constant "jabs" of up-elevator and right rudder to keep the model pointing straight up. Keep in mind that when you see the bottom of the plane as it rotates, rudder input will be reversed (just as the aileron inputs are when the model is coming toward you). This will take a little time to get used to.

■ **Recovery.** Nothing lasts forever; even a perfect torque roll eventually stops. When you notice that your model is beginning to fall out of the torque roll and you can't save it, advance the throttle slightly past the point of equilibrium and let the nose fall, or advance to full throttle and recover by going straight upward. If your plane falls out and heads toward the ground, be sure to gain sufficient airspeed before you try to pull its nose up. If you have a chance, switch from the 3D rates back to your low rates so you don't suddenly, in a panic, give the plane a huge deflection of elevator. If you don't switch to low rates, be very careful while pulling out.

Remember, this maneuver takes a lot of practice to master, but these techniques should get you started on your way to completing your first torque roll. It may take months to reach a point at which you can hit a successful torque roll only 50 percent of the time. Have fun, and don't get frustrated. Keep modifying your technique and setup until you find what works for you. When you do your first perfect torque roll, you won't want to do anything else for quite some time. The adrenaline rush is quite addictive, and the smile on your face will be hard to erase. ✈

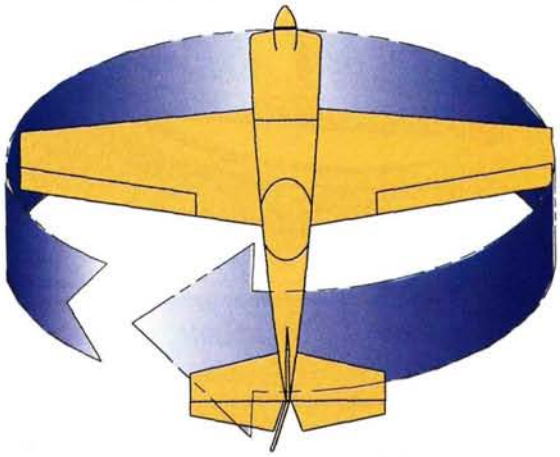
__Desert Aircraft__, P.O. Box 18038, Tucson, AZ 85731; (520) 722-0607.
__Futaba Corp. of America__, exclusively distributed by Great Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 61826; www.futaba-rc.com.
__Menz Props__; distributed by Desert Aircraft.

Figure 2. Rocking the throttle

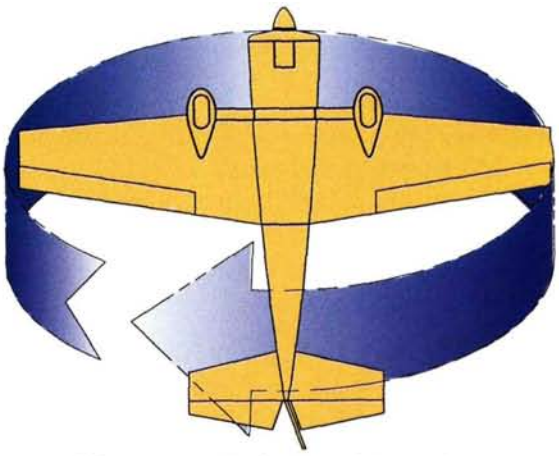


Once the model has come to a stop vertically and you've established equilibrium, advance and retard the throttle (rock it), and the model will begin to roll in reaction to the engine's torque. No aileron input is required; all corrections are made with throttle, rudder and elevator.

Figure 3. Rudder corrections



When you see the top of the airplane, rudder input is correct.



When you see the bottom of the airplane, rudder input has to be reversed.

As the airplane revolves, the corrections for its nose-vertical position are reversed as you see the top and then the bottom of the plane.

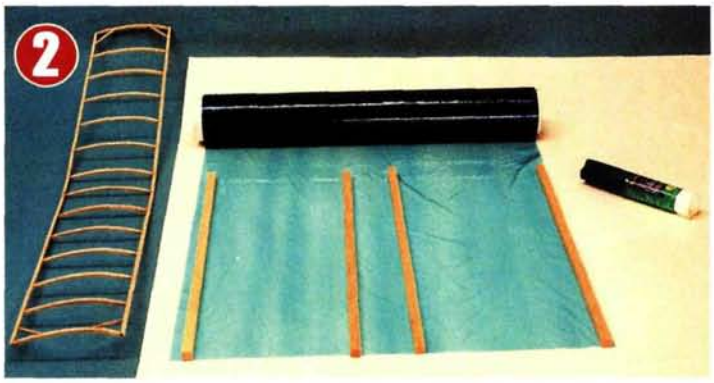
Inexpensive and easy to use

Work with light plastic film for micro flyers

by Dave Robelen

Author's Plinker model covered with blue Reynolds Color Plastic Wrap.

Materials and tools needed to apply Reynolds Plastic Wrap to the model framework.



I use a glue stick to attach the 1/4-inch-square balsa "handles" to the wrap. Note the direction of the panels; the wrap shrinks more along its length and will sag less between the ribs in this direction.

Coat the frame with thinned spray contact cement. The bottom of each rib must be coated when you cover under-cambered wings.

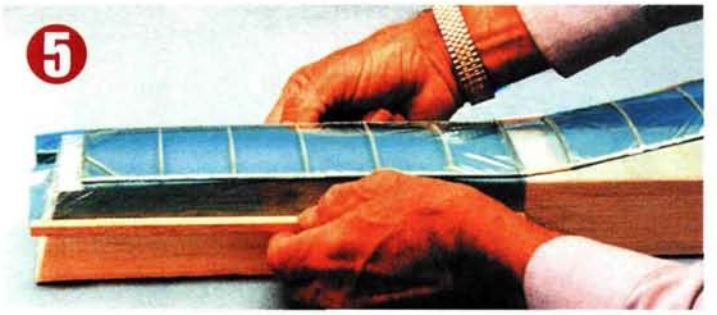
Very small, light models are becoming quite popular. In the past, most of these models have been covered with some form of tissue paper. Although tissue covering can be quite attractive and light, there are occasions when an alternate material would serve better. There are plenty of plastic films on the market designed for standard RC models, but they are often too heavy for the lightest models (those being flown with micro equipment).

Several commercial films that are not specifically designed for RC models are quite thin and light, and they are well-suited to light models. These products are usually marketed by specialty suppliers and are therefore less well-known. Reynolds Plastic Wrap (plastic film, sold in grocery stores) does an excellent job as a light model covering and comes in a variety of colors. Other products, such as trash-bag liners and dry-cleaner bags, have also been used with some success. This article compares three products—Reynolds Plastic Wrap, Mylar and RA Microlite—and shows a typical application.

Let's begin by comparing approximate weights: Reynolds Plastic Wrap weighs 0.00833 gram per square inch; 0.0015-inch-thick clear Mylar weighs 0.0055 gram per square inch; RA Microlite weighs 0.00333 gram per square inch. Both the Reynolds plastic film and the clear Mylar will weigh slightly more when applied because the adhesive is not coated onto the film and must be added separately. To get an idea of how this affects a model's weight, consider my Plinker, which has a wing area of 60 square inches covered on both sides. It gained 1.8 grams with the Reynolds plastic film, about 1 gram with the clear Mylar and 0.7 gram with the RA Microlite film.

In terms of warping power, Mylar tends to have the most "pull," which causes the wing to bow noticeably. RA Microlite

Use the balsa handles to position the wrap on the framework. After it is in place, rub the wrap tightly against the glue (be sure to also attach the film to the bottom of the ribs). Sharp scissors work best to trim the excess wrap.



Pull the wrap as taut as possible across the top of the wing before rubbing the cement and trimming. Let it dry for several hours before shrinking it.

film causes some bowing, while Reynolds plastic film has minimal warping tendencies and won't bow the most fragile parts.

Reynolds plastic film seems to be the most damage-resistant; it is better able to resist being punctured and torn, while the other two films are more easily punctured and tend to tear more readily once punctured.

Because of Reynolds plastic film's unique characteristics, I am going to describe in more detail its application on a model.

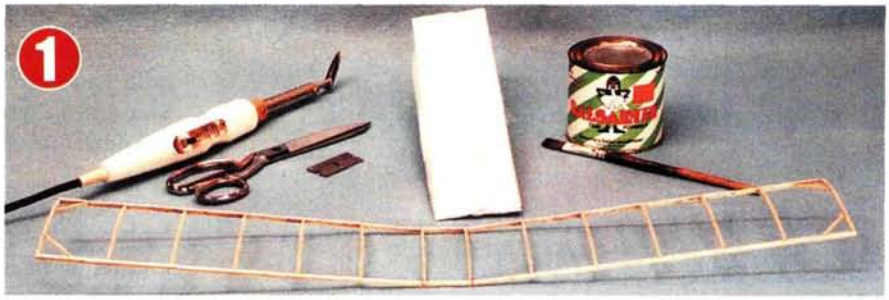
The Reynolds film technique is unique because both the covering material and the adhesive come from non-hobby sources. In fact, all of the materials you need may be found in a modern "super store" such as Wal-Mart. The wrap itself is in the grocery department, the spray glue can be found in the hardware or crafts section, the lighter fluid is from the smoke shop and the tools are from other departments! The 0.0015-inch-thick clear Mylar is sold by Model Research Labs, and the RA Microlite film is available from David Lewis. Balsarite film adhesive, distributed by Coverite, is available from the usual hobby channels.

The most distinct difference among the covering methods is the minimal heat required by the Reynolds plastic film; the other two films are attached with a trim seal covering iron. When I cover a larger part, such as a wing, I find that, because of Reynolds plastic film's "clingy" nature, it is easier to smooth out over a sheet of poster board. You can glue "handles" to the sections of plastic with a glue stick. Small, flat parts such as the tail surfaces can be coated with the adhesive and pressed onto the smoothed-out plastic, while the strips for the fuselage are small enough to lift off the poster board and apply to the model without a problem. 3M Super 77 spray contact cement works well with the Reynolds plastic film. I spray small amounts of this into a spray-can cap, thin it slightly with lighter fluid and then brush it onto the frame. I apply the plastic while the glue is still sticky.

Allow the glue to dry for several hours before you shrink the film. The Reynolds film shrinks with very little heat compared with the Mylar products. I have had fine results with a hair dryer, a floodlight bulb and even a furnace vent as sources of heat for shrinking. Modelers in warm climates have reported good results by putting the model parts in a closed automobile that is sitting in direct sunlight.

To apply clear Mylar film, first coat the framework with Balsarite for film, and when that has dried, attach the film using a trim seal iron set on high heat. You can shrink the film with the same tool. RA Microlite film comes with an adhesive coating that's quite adequate, except for use on the bottom of under-cambered ribs, where I use Balsarite. Use the trim seal iron to attach and shrink the film.

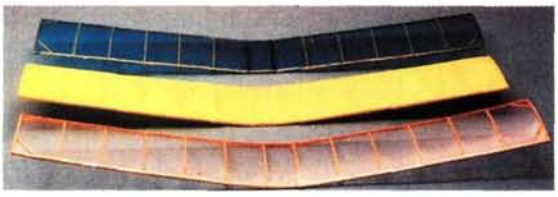
MYLAR COVERING



The tools and materials needed for the Mylar covering (they are the same as what's needed for RA Microlite film).

Applying the Balsarite film formula. Use full-strength adhesive wherever the covering will be attached. Two coats work best for me. Allow the Balsarite to dry before attaching the covering.

Above: to attach the Mylar to the framework, first set your trim seal iron to high heat. Start by tacking the covering to the center of the ribs at each end and continue to work around the frame with small tacks. Remove as many wrinkles as you can before you fully seal the film into place. Use the same iron and heat setting to shrink the film after both the bottom and top are covered. Right: use your trim seal iron set on high heat to attach and shrink the RA Microlite film. Try to get the material into final position before you attach it; if you pull it loose, the adhesive coating may separate from the film.



Three identical wings with different coverings (top to bottom): Reynolds Plastic Wrap, RA Microlite film and Mylar. Note the extra dihedral pulled into the Mylar-covered wing by the taut covering. The weight difference among these covered wings is less than 1 gram; Reynolds Plastic Wrap is the heaviest, and RA Microlite film is the lightest. All are covered on both sides for this illustration, although single-surface covering is often desirable because it results in even less weight gain.

These films, used with the adhesives described, are suitable for all model types that do not use glow fuel. Most of these adhesives are not fuelproof, although they can withstand moisture. ✈

Balsarite (by Coverite); *distributed by Great Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948; fax (217) 398-0008; www.greatplanes.com.*
RA Microlite; *available from David Lewis, 4027 Rocky River 26, Cleveland, OH 44135-1147; (216) 251-2517.*
Mylar; *available from Model Research Labs, 25108 Marguerite #160, Mission Viejo, CA 92692.*

by Keith Sparks

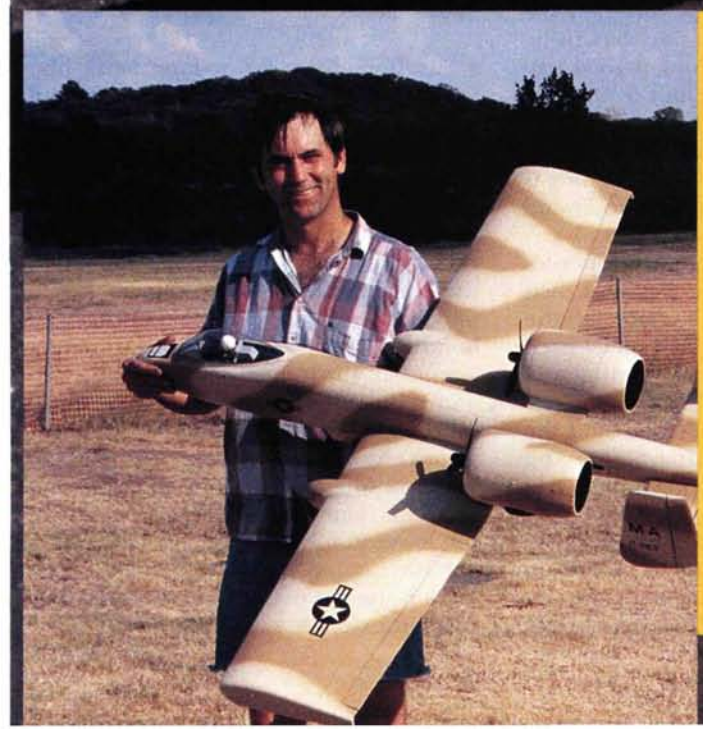
I have always liked the idea of flying jets, but I never wanted to make the kind of investment the ducted-fan equipment and engines required. This A-10 makes a nice compromise: it's really a low-wing trainer dressed in jets' clothing.

This A-10 project started with a smaller version I had designed for twin .15-size engines. I improved on the smaller version and corrected some imperfections until the little Warthog flew well. I then built a larger .25-size version that incorporated all of the changes I made to the smaller version. The larger model flew great! I then built a third model; the one depicted here. I have scratch-built many airplanes; some have turned out great and others have turned out not so great. I am very proud of my efforts with this A-10.

I first showed off the model at the SMALL airplane meet in Mammelle, AR, in 1999. Since then, the A-10 has been tested and flown many times. I am confident that any RC pilot with average flying skills can easily fly this model. I used the airfoil from a trainer wing to give it good slow-speed handling. You could consider the A-10 a short-coupled, low-wing trainer.

An easy-to-build and fly twin prop-jet

A-10 Warthog



SPECIFICATIONS

Model: A-10 Warthog

Type: prop-driven jet

Wingspan: 61 in.

Wing area: 700 sq. in.

Weight: 7.5 lb.

Wing loading: 24.6 oz./sq. ft.

Engine used: two O.S. .25 FX

Radio: 4-channel (rudder, throttle, elevator and aileron)

Comments: designed by Keith Sparks, the A-10 is a low-wing trainer that looks like a Warthog. It has a flat-bottom trainer-wing airfoil and good slow-speed flight performance. It is easy to build and fun to fly. Vacuum-formed plastic parts are available from the author: Keith Sparks, 7755 Nor-east Dr., Fort Worth, TX 76189-6805; (817) 656-2295; psparks@worldnet.att.net.

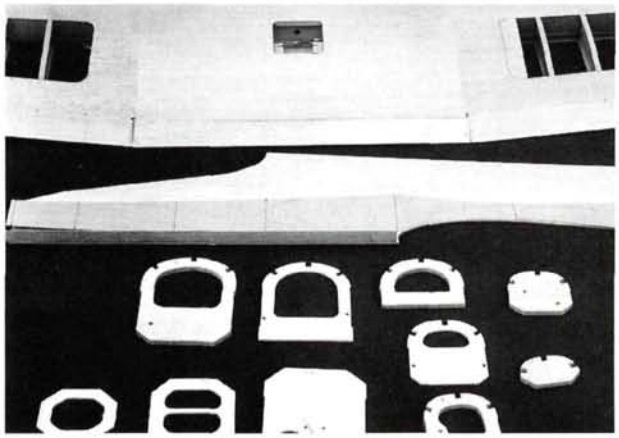
CONSTRUCTION

• **Wing.** Since the wing has a trainer airfoil, it has a flat bottom from the main spar to the trailing edge (TE). This makes building the wing easy because you can build it flat over the plan. The wing center section is the first part to be built, and it is fully sheeted, top and bottom. Pin the bottom sheeting and the bottom spar into place and use the ribs to position the solid ½x2-inch TE correctly. Cut notches into the TE to secure the ribs to their proper locations. The ribs that support the landing-gear block should be assembled with their ply doublers before you glue them into place. Make sure to install the aileron mounting plate, the alignment dowel supports and the landing-gear blocks before you sheet the top of the center section. The aileron servo and pushrod should also be installed at this point. Note that the landing-gear vertical support has to be notched to clear the pushrod. A good way to locate the landing-gear slot in the bottom wing sheeting is to drill through the landing-gear block vertical slot and the bottom sheeting before the top sheeting is installed. Add the leading edge (LE) and sand to shape.

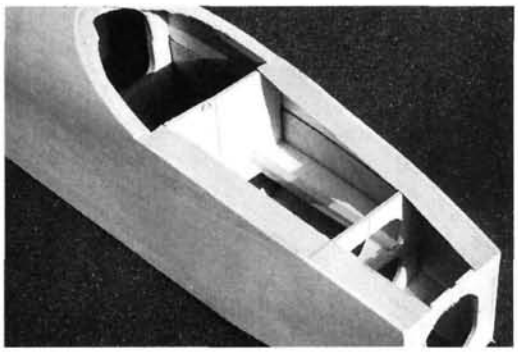
The outer-wing panels are tapered. They are built flat on the plan and then attached to the center section at the proper dihedral angle (1 inch under each tip). Again, pin the bottom sheeting and main spar over the plan; then use the ribs to properly locate the TE stock. Add the vertical-grain spar webbing before you glue the top sheeting into place, then add the LE and sand to shape.

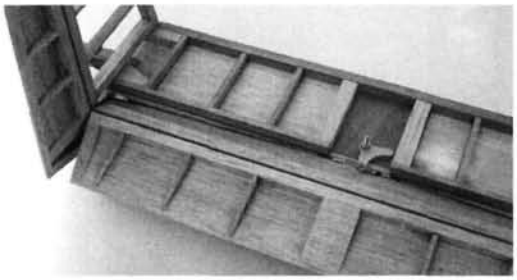
Make the ailerons by cutting them out of the TE stock, hinging them into place. Don't glue the hinges until the wing and ailerons are covered. You can choose either flexible aileron cables or bellcranks with solid pushrods for control; both details are shown on the plan.

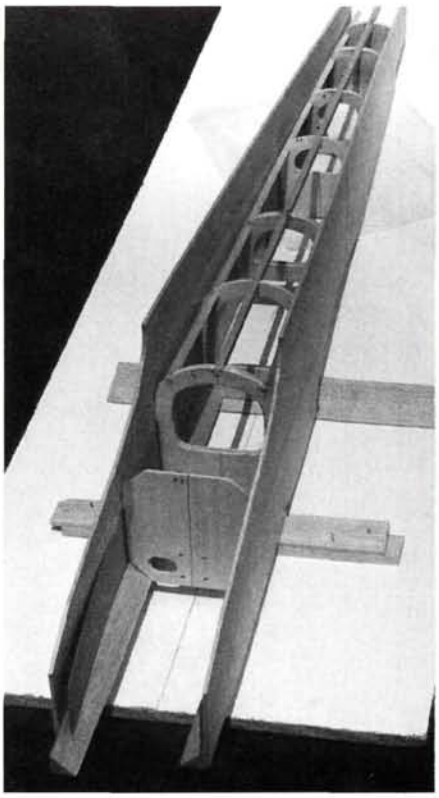
• **Fuselage.** Start by making balsa plywood. The outer sheets are 1/16-inch hard balsa, while the core sheet is ⅛-inch soft or lightweight balsa. The core sheet grain should run side to side on the formers; the other two sheets should have grain running from top to bottom. This combination creates a strong, yet light, lamination that is perfect for making formers. It also provides a wide area for the skin sheets to bond to. Before you begin construction, cut out all the formers and make the left- and right-side fuselage pieces. To minimize wasted material, use the fuselage skin layout shown on the plan. The sides are made of ⅛-inch balsa sheet, and a 1/32-inch plywood doubler runs the full length of the lower fuselage section. To help round out the fuselage shape, ¾-inch balsa tri-stock is used in each corner, except at the rear turtle deck from the aft section of the



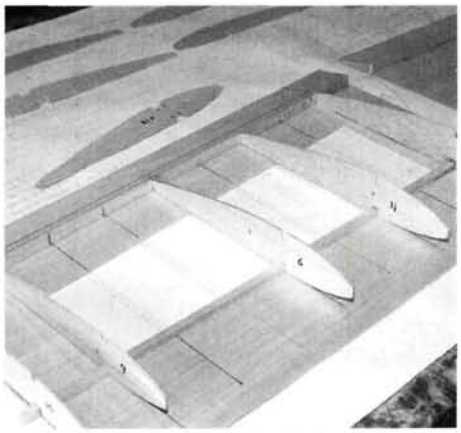
Left: fuselage sides and formers ready for assembly. The wing panel is ready for the ailerons to be cut free. Below: here, the fuselage sides are ready to be wrapped around the forward formers.



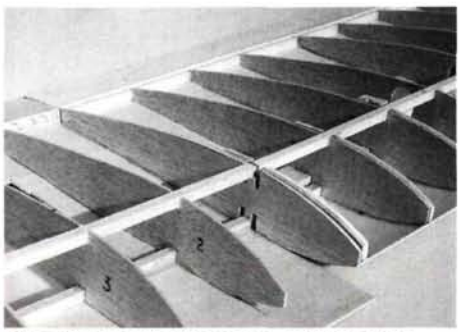




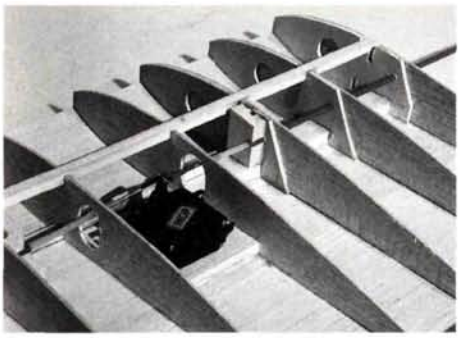
Top: fuselage nose detail before shaping. The ply doublers at F3 and F4 can be seen, as well as the servo tray mount. Bottom: the rudder linkage and the bellcrank can be clearly seen here. Once everything is in place, the top stab sheeting can be added.



Use the ribs to position the TE in its proper location. The TE is notched to accept the rib ends.



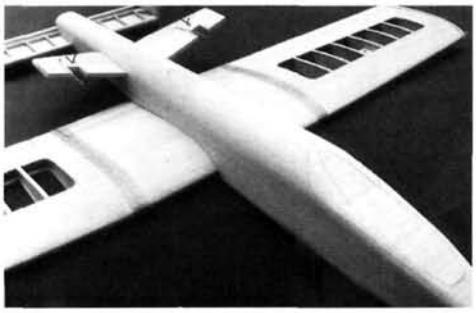
The ribs have flat bottoms, and the wing easily builds flat on the board. Note the slots cut for the dihedral braces.



The aileron servo installation detail. Note the large holes cut into the inner ribs to clear the pushrod movement.

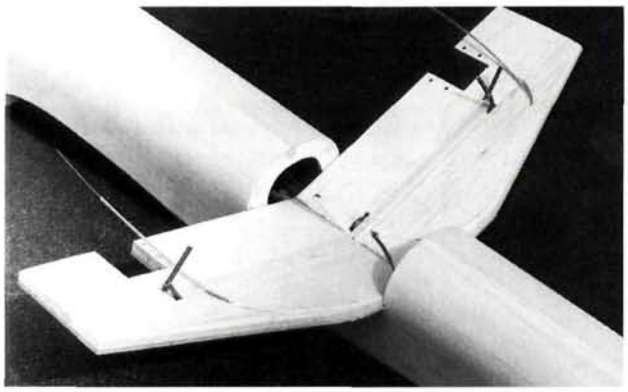
canopy to the tail. This portion of the fuselage is sheeted with ⅛-inch balsa.

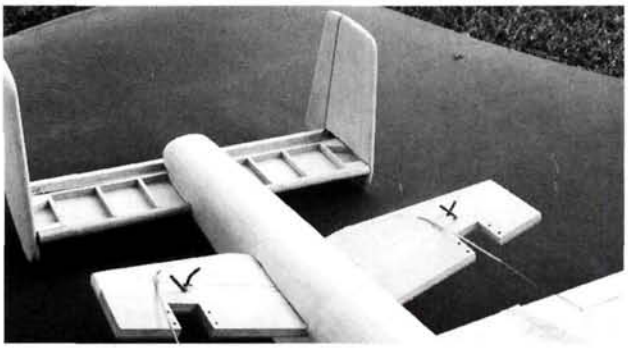
Join the two sides to formers F3, F4 and F5; be sure to keep the structure straight over the top view. When the glue has dried, add the aft formers and then formers F1 and F2. To make it easier to bend the nose into shape, I used a razor saw to make relief cuts in the tri-stock from F3 forward. I then glued ½-inch tri-stock to the aft end of the doubler to form the elevator saddle. It is a good idea to attach the nosewheel attachment bracket to former F3 before you glue the former into place.



Above: the fuselage nose has been sanded to shape, and the fiberglass reinforcement has been added to the wing joints. Right: the stub-wing cutout has been reattached, and the tail group is now installed; almost ready to cover.

Right: the stub-wing assembly has been completed and is being test-fitted to the fuselage.





To make the cockpit floor, sand the top edges of the sides flush to the top of F1 through F4, then glue the ⅛-inch sheeting into place. I trimmed a Sig 11-inch canopy to fit the shape and angles of the cockpit floor. Mark the canopy's position with a pen. Using those marks as a guide, sand the upper-forward corners to shape a radius around the canopy. I used ½-inch balsa blocks to complete the nose and sanded them to shape as well.

• **Mounting the wing.** To mount the wing, use scrap ½-inch tri-stock forward of the F7 former to build a square block. Then bond the plywood wing-mounting plate in place using epoxy. Sand the wing saddle to fit the wing, and then drill the hole in the TE for the wing-mounting bolt.

• **Stub wing/motor-mount construction.** Begin by cutting ⅛-inch lite-ply to the dimensions on the plan. Cut the motor mounts from ¼-inch aircraft ply and, using wood glue, bond the ¼-inch aircraft ply to the ⅛-inch lite-ply and cut the motor-mount openings. Next, drill the holes for the motor-mounting screws, the throttle control rod and the fuel lines. I used ¼-inch balsa to fill the aft portion of the ¼-inch ply. This "filler" holds the throttle cables and fuel line in place and prevents the stub wing from twisting. Test-fit the fuel lines after each bend is made to ensure that they lie flat against the lite-ply. Next, the ¼-inch balsa filler should be cut to clear the fuel and pressure lines to allow all four to lie flat. Glue the remaining filler into place; remove the tubes before the glue sets up. Cut the stub-wing assembly into two pieces along the centerline. Sand a 20-degree angle on each side and epoxy them together. With half of the stub wing flat on the table, the other end should be positioned 5¼ inches off the table. The engines are held in place with screws and blind nuts. I used J'Tec mufflers because they require you to tilt the cowls up slightly for them to clear. If you want to use a 6-inch or larger prop, a higher stub-wing angle must be used to provide a minimum ⅜-inch clearance between the props and the wing.

• **Stub-wing installation.** To prepare the fuselage to receive the stub wing, use a razor saw to remove the skin and stringers

FLIGHT PERFORMANCE

This A-10 was designed for rough field operations. With the O.S. .25 FP engines installed, the takeoff roll in 2 inches of grass was about 60 yards long. Using ½-inch larger tires shortened the roll to 40 yards. With the O.S. .25 FX engines and 3-blade props installed, the takeoff roll was a little shorter. Once the A-10 breaks ground, the climb-out is equal to a trainer.

• HIGH-SPEED FLIGHT

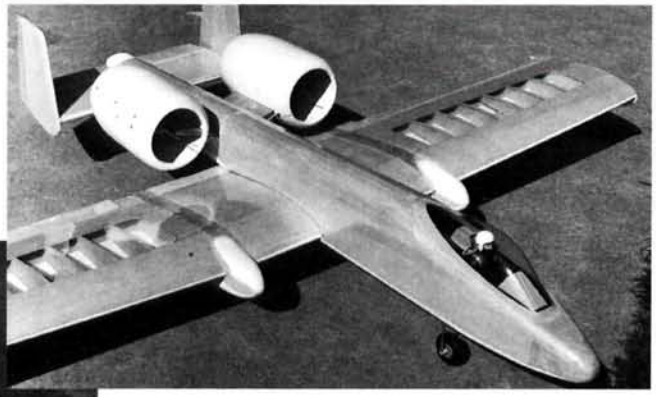
With the engines wide open, the A-10 will go where you point it. The FX does achieve a better vertical performance. After several split-S maneuvers, loops and high-bank turns, the folks at the field wondered what was keeping it in the air. Once again, it is a slightly short-coupled trainer disguised as an A-10. There was one surprise when the high-speed pass was made with the 3-blade prop; the cowls made a whistling sound. It was pretty cool.

• SLOW-SPEED FLIGHT

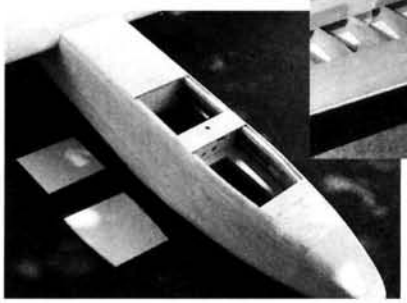
At ⅓ power, the A-10 slows down like a Sig Cougar. It was a little faster than I wanted but not as pitch sensitive as I thought it would be. All that drag out there slows it down fast, so establish a sink rate and cut the throttle over the runway. With a little practice, nose-high landings are slow and predictable. Tip stalls have not been a problem.

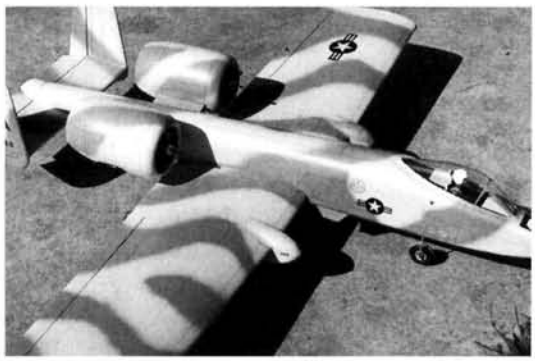
• ENGINE-OUT PERFORMANCE

With the engines so close to the centerline, the dual vertical fins and all that drag behind the wing, an engine out is more of a nuisance than a problem. You will hear the engine quit first and then notice that the plane flies like an aileron is out of trim. I apply some rudder trim, then head for the runway. One engine will keep it in the air, but it won't allow it to climb. The tanks are forward of the engine, so you must tip the nose down to see whether the engines will lean out.



Covered with white and clear MonoKote, the A-10 is now ready to be painted.





Above: view of the underside servo hatch detail. Right: the finished model with panel lines added for detail.

between formers F7 and F8 above the skin doublers. Save the removed section to put back in place later over the stub wing. I used the wing as my reference and a Robart incidence meter to check the engine-thrust angle (it should be 0 degrees to the wing angle). For added support, you can add tri-stock balsa on the inside of the stub-wing and fuselage joint.

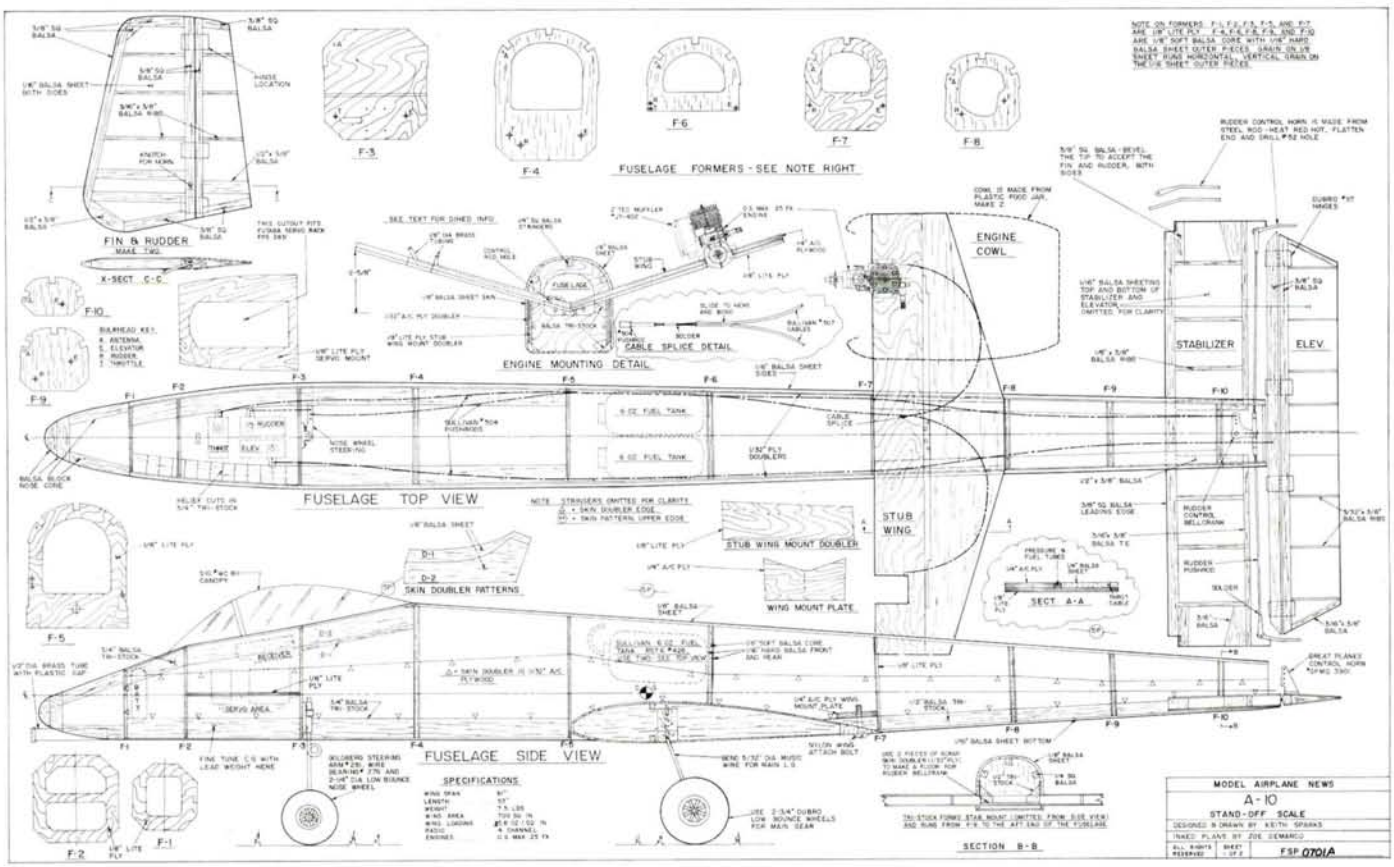
• **The tail group.** The horizontal stabilizer is a built-up structure much like the wing center section and is sheeted top and bottom. The vertical fins, elevator and rudders are built over the plan. These parts can be made from TE stock; however, built-up surfaces will reduce the amount of lead needed to balance the plane. You can use scrap plywood from the fuselage skin doublers to make a support for the rudder bellcrank. Once the rudder rigging and hinging is complete, taper the vertical fin LEs and sheet them with 1/16-inch balsa.

You can cover the vertical stabilizer and rudders with clear MonoKote and attach the vertical fins to the horizontal stab with epoxy. Be careful not to use excessive epoxy. Then drill the holes for the rudder control rod, cover the elevator with MonoKote and attach the control surfaces with epoxy. Note: the rudder control horns must be pushed all the way into the rudders to the bend as shown on the plan to achieve full travel. With the wing attached to the fuselage and shimmed to 0-degrees incidence, the horizontal stab should be set at 2 degrees of positive. Some slight sanding may be required.

FINISHING TOUCHES

The radio installation is straightforward. A little bend in the throttle control arm is needed to clear the elevator servo arm. The control movements are: elevator, 3/4 inch up and down; rudder, 3/4 inch left and

Continued on page 94



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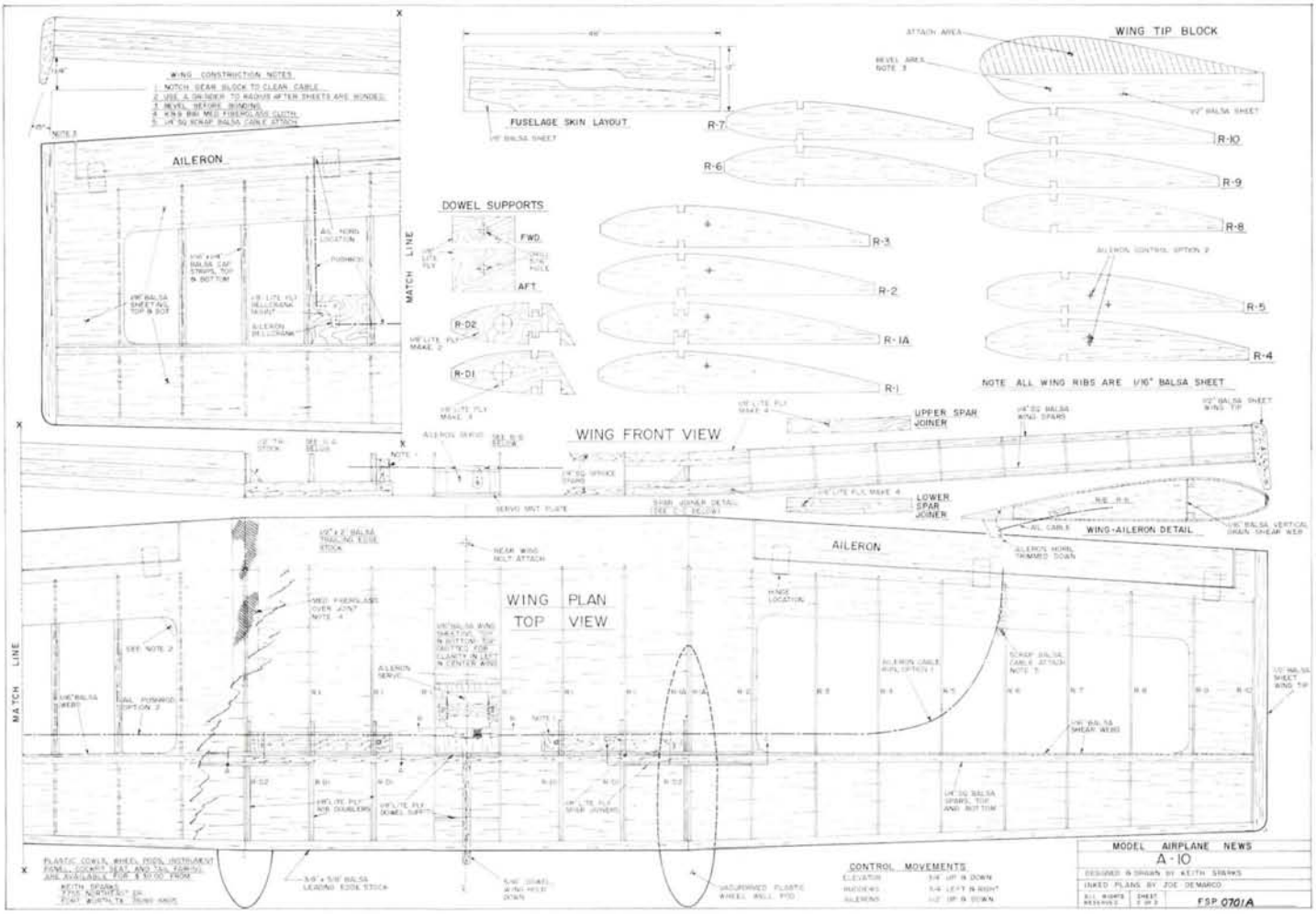

To order the full-size plan, turn to "RCStore.com" on page 148.

right; ailerons, ½ inch up and down.

Sheet the bottom of the fuselage with 1/16-inch balsa at the rear and ⅛-inch at the nose. The hatches at the nose are ⅛-inch lite-ply surrounded by ⅛-inch balsa. Sand the bottom radius from the nose to the tail.

I covered most of the A-10 with clear MonoKote and used white on the bottom. Clear is lighter and just as tough, and it sticks better. The secret to making paint stick is to roughen the surface with fine steel wool or a Scotch-Brite pad; be careful not to use excessive pressure that might dent the balsa. The gray plane was painted using Black Baron primer and automotive primer. The tan one was painted with LustreKote tan and cream. The rest of the finishing was identical for both planes. To give the planes depth, I used a Top Flite warbird scale template and panel line pen to detail the models. Then I sealed the lines with LustreKote flat clear. If you use a different pen, practice on scrap plastic first; the clear coat can smear some types of ink.

I made the engine cowls from 0.060 vacuum-formed plastic and the wheel-well nacelles from 0.040 plastic. These parts could be made from balsa or Styrofoam, and plastic mayonnaise jars look as though they might make promising engine cowls. I will mail you cowls, wheel nacelles, instrument panel, cockpit seat and fuselage tail fairing on request for $30. *[Editor's note: see address in "Specifications" box.]*

AT THE FIELD

I used two O.S. .25 FP engines on the first model and a pair of O.S. MAX .25 FX on the second. Both engine types perform very well, but the model has a slightly better climb rate with the FXs.

Our runway is a very nice, smooth grass strip. If the grass is taller than ½ inch, the A-10 can't get up to speed for takeoff with its small tires. Using larger wheels is the fix. The general rule is if the grass touches the wheel's rim, the wheel is too short. From short grass, takeoffs are easy and the tricycle landing gear makes steering a snap.

The onboard ignition I installed on the second plane solved the engine-out problems I experienced on the first model. An engine out, however, isn't really a heart stopper. With other twins I have flown, I had to fight the plane all the way to the end of the runway, kill the power and land. Because of the closely spaced engine locations, you can fly the A-10 around a bit to set up a nice landing.

If you've ever wanted to fly a twin or a jet fighter, the A-10 is a great way to kill two birds with one stone.

Black Baron; *distributed by Coverite (dist. by Great Planes).*
Great Planes Model Distributors Co., *P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948; fax (217) 398-0008; www.greatplanes.com.*
J'Tec, *660 Pacific Ave., Oxnard, CA 93030; (805) 487-0355; www.jtecrc.com.*
LustreKote; *distributed by Great Planes.*
MonoKote; *distributed by Great Planes.*
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MODEL AIRPLANE NEWS
PRODUCT
REVIEW

HITEC

Eclipse 7

by Bob Aberle

A new standard in affordable versatility

For years now, Hitec's top-of-the-line RCD transmitter has been the Prism 7. One of its highlights is its optional Spectra 72 synthesized radio frequency (RF) module that allows the modeler to dial up any of the 50 available RC aircraft channels. This system permitted the selection of either high or low FM deviation. These features made the Prism 7/Spectra module capable of operating just about any brand of FM receiver on any aircraft channel from 72 to 73MHz.

For 2001, Hitec has introduced a replacement for the Prism 7: the Eclipse 7. This new, 7-channel transmitter has expanded memory that allows you to store up to seven models and name them. Like its predecessor, the Eclipse can include the Spectra module and will let you select high or low FM deviation, so just about any FM RC receiver in your inventory can be operated by the Eclipse.

The Eclipse has many new features, including digital trims, auto engine-cut switch, exponential rate control, specific programming for fixed-wing aircraft, gliders and helicopters, a very large, clear LCD screen and separate dedicated computer input keys. Four basic systems are offered: an airplane version with the Supreme receiver and four HS-422 servos; an aircraft Spectra version with the Spectra module, Super-Slim receiver and four HS-425 BB servos; a helicopter version with a Supreme receiver and five HS-425BB servos; and last, the Eclipse transmitter only with the Spectra module. All systems include a 600mAh Ni-Cd transmitter battery pack, overnight charger and an excellent instruction manual. The airplane and aircraft Spectra systems include 600mAh receiver packs; the heli version gets a 1000mAh receiver pack. By offering the Eclipse in these four configurations, Hitec allows the modeler to tailor a system to a specific application. Having the transmitter and Spectra module available separately makes the system very economical as well. The street price for the basic system is just $240.

The Eclipse has seven-model memory with a seven-character name display on its big LCD screen.

I chose the airplane system as the subject of this review. All of the Eclipse systems are available on the 72 to 73MHz RC channels, but not on six meters. The computer memory is of the non-volatile type and, as such, does not require a backup battery. Because I already own a Spectra, I did not select an Eclipse package that included one, and I used my Spectra with the Eclipse throughout the course of my evaluation. Compatibility with previous Spectra modules and the availability of the new Eclipse with or without a Spectra makes the system very appealing to owners of earlier Hitec products.

ABOUT THE TRANSMITTER

Both the control-stick length and the stick-spring tension can be adjusted. The spring tension does require that you remove the rear case cover, and a "softer" or "smoother" throttle stick ratchet is provided. The Eclipse uses digital trims, and since this type of trim will no doubt even-

The digital controls are clearly labeled, and the excellent instructions make it easy to master the functions. Of particular interest are the one-touch engine "Lock" and "Cut" buttons at the bottom of the panel.

tually replace mechanical trims altogether, you might as well start getting used to them. Since the trim lever has been replaced by a two-direction push-button switch, you can't just look to determine the amount of trim being employed. To check the trim setting, call up the Trim Screen from the Basic Display Menu, then apply trim in either direction and observe the momentary digital readout on the LCD screen. Remember to restore the trim to its original position (you just moved it one position while attempting to find out where you were!). I would prefer to see a three-position trim switch, with a push-down action to tell you where the trim is. An engine cutoff switch kills the engine without the need to pulse the throttle digital trim button.

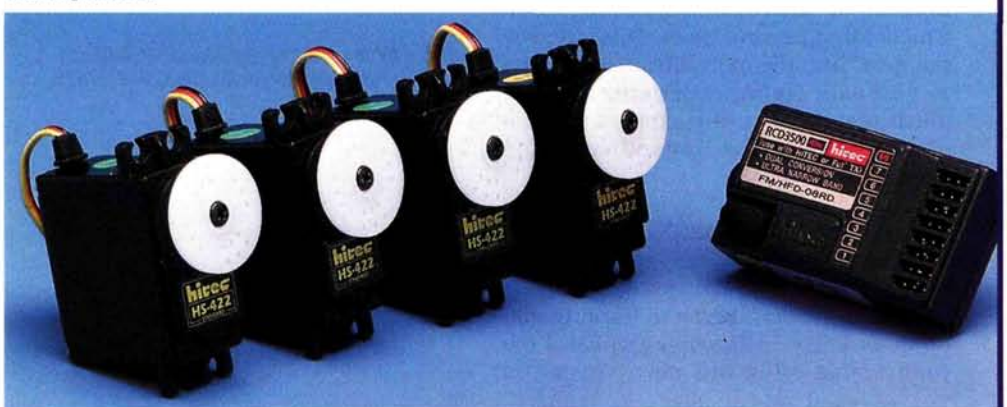
The 8-cell Ni-Cd transmitter battery uses conventional 600mAh cells. Many of us now choose higher capacity NiMH cells (1100 to 1600mAh) of the same AA size. Regardless which battery pack you choose, a low-voltage warning appears on the screen and a beeper sounds when the operating voltage drops below 9.3 volts. There is no voltage available at the charging jack, so you have to remove the battery pack (it has a connector) and test or cycle it outside the transmitter case.

The lock button is an interesting safety feature. Press it, and the word "Lock" appears on the LCD screen. This locks your throttle servo in its last position. This is excellent for an electric-powered aircraft as you walk to and from the flightline. It is also a good idea for any model awaiting clearance for a takeoff. With this lock feature, you will not experience an inadvertent motor start-up.

The Eclipse transmitter has both a trainer switch and a jack. An optional cable allows you to connect to another Hitec RCD transmitter (with a mating jack) for flight-training purposes.

The instruction manual (prepared in the U.S.—not a translation!) is excellent in every respect and is easy to follow. It was compiled by the noted modeling author Don Edberg. I found the diagram labeled "Switch Configuration List" to be quite impressive. It includes a pictorial of the transmitter case with arrows calling out each of the switches, and it explains the function of each switch, whether for "Acro," "Glider," or "Heli." I liked this

The airplane version of the Eclipse 7 comes with four HS-422 servos and a Supreme receiver as well as a 600mAh receiver battery and standard switch (not shown). Upscale packages substitute HS-425BB ball-bearing servos.



SPECIFICATIONS

Model: Eclipse 7 (airplane version)

Manufacturer: Hitec RCD Inc.

Transmitter: 34 oz., 7-channel dual stick (Mode II or I); seven model memories intended for fixed wing, glider, or helicopter control; onscreen and audible low-battery warning when the voltage falls below 9.3 volts; optional Spectra module (provides all 50 aircraft channels).

Receiver: RCD 3500 Supreme Series 8-channel FM; 2.3x1.4x0.8 in.; weight: 1.3 oz.; dual-conversion circuitry with Hitec proprietary connectors; 40-inch antenna.

Servos: HS-422 deluxe (non-ball-bearing); 1.6x1.4x0.8 in.; weight: 1.6 oz. each; torque rated at 43 oz.-in.; travel time of 0.20 second for 60-degree rotation; 12-inch cable.

Accessories: switch harness with charging jack (no provisions for bulkhead mounting), 4-cell, 600mAh receiver Ni-Cd battery pack, dual-output battery charger, aileron-extension cable, extra output arms and servo-mounting hardware, frequency-flag set and excellent instruction manual.

Weight of airborne pack: 11.5 oz.

Street prices: $240 (transmitter only with Spectra module); $290 (airplane version); $320 (helicopter version); $365 (aircraft Spectra version).

Comments: an improved/updated version of the popular Prism 7 system with many more features available; simple operation; ideal for the sport flier who would like to add control features as needed; large LCD screen a pleasure for those with sore eyes; excellent price, considering what you get.

HITS

- Seven memory positions with 7-character model naming.
- Spectra-synthesized RF module allows all 50 aircraft channels to be used.
- Ease of operation and large LCD screen.
- Excellent instruction manual.
- Has "Flight Mode" and "Flight Condition" switches to alter preset conditions in mid-flight.

MISSES

- Digital trim positions can't be determined at a glance.

presentation but would like to see it enlarged. The print was pretty fine for these old eyes.

At the top of the transmitter case is a very large, 2½x1¼-inch LCD screen with numbers almost ½ inch tall. Pressing both edit keys and turning the power on gets you into the Basic Menu Functions. In this menu, you can select the primary functions of the Eclipse: any of seven memory positions, data copy, aircraft type ("Acro" for fixed wing aircraft, "Glid" for gliders or sailplanes and "Heli" for helicopters), wing types (2 or 4 servos) for gliders, and swashplate types for helicopters. You can name your model with up to four letters and three numbers (for example, "CUB59" for a Piper Cub operating on channel 59). You can select high or low FM deviation, timer setup (selectable countdown from 60 minutes to zero) and reset to factory default positions.

The Spectra module is the highlight of the Eclipse system. Like its predecessor, the Prism, an Eclipse-equipped Spectra can operate on any of the 50 available RC airplane channels. The Spectra module can be purchased with the Eclipse or as a separate unit later on.

Computer inputs are made through a set of dedicated push-button switches. There are two "edit" switches (up and down), two more for "cursor" (left and right), two for "data" (increase and decrease) and one for "clear," which turns control functions on and off. To get into the Aircraft Function Map or Menu with the power already on, just press both edit keys together. Now you can scroll through a long list of functions that include endpoint adjust (EPA), dual rates (aileron, rudder and elevator), exponential rates (EXP), subtrim, servo reversing, programmable mixing (five total), landing-function settings, flap trim, elevator/flap mixing, coupled rudder/aileron, elevon mixing, V-tail mixing and flaperons. Control inputs are saved to the computer memory when you go on to the next menu item or simply turn off the power; there is no separate saving procedure to worry about.

I'm not going to detail all the switch locations and functions, but I do want to mention an interesting feature. It involves a three-position switch designated "flight mode" at the top-left corner of the case, and a long, bat-handle, two-position switch marked "flight condition" at the top-right corner in the rear. By using a combination of these two switches, you can establish three sets of flight controls involving trim positions, dual-rate settings and exponential values (for aileron, elevator and rudder). Values can be established for takeoff, normal flight and landing approaches. A flip of a switch easily changes these conditions during a flight. This kind of feature is usually only available on expensive, top-of-the-line transmitters. The Eclipse features a landing aid that moves both flaps and elevator to predetermined positions to help make steep descents or limit airspeed in dives. This is also controlled by the "Flight Mode" switch.

All of these features may initially seem complicated, but remember: you only have to use the ones needed to control your own model. Additional, unused controls can be ignored until you progress to a model that requires them. This way, you can grow into the more advanced features as you gain flying experience. This is much preferable to the expense of completely replacing a transmitter when you've outgrown it.

The airplane version comes with this standard Hitec RF module instead of the Spectra. Offering the Eclipse in four packages allows modelers to choose whichever best suits their needs and budget. If you're like me and already have a Spectra, this is a great option.

CONCLUSION

The Eclipse is a "full-service" RC system in that it is computer-controlled, contains many features and is easy to learn, thanks to an excellent instruction manual. I felt comfortable using this new transmitter right from the start. I'm still a little apprehensive about the digital trims, but they are growing on me. It's hard to argue with the additional precision that digital trims provide. Overall, this is an extremely flexible system that is capable of handling almost any type of RC aircraft you care to fly. By offering the Eclipse in a variety of packages and by making it compatible with Spectra modules from previous products, Hitec has done a real service for the consumer. You can select the system that meets your specific needs without having to buy redundant or unnecessary equipment. The versatility and value of the Eclipse make Hitec's eagerly awaited entry into the premium computer-radio market a resounding success.

The Flight Mode switch (second from left), with the Flight Condtion switch on the opposite side of the case, allows the pilot to toggle between settings for takeoff, normal flight and landing.

Hitec RCD Inc., 12115 Paine St., Poway, CA 92064; (858) 748-6948; fax (858) 748-1767; www.hitecrcd.com.

Select a prop using thrust to weight ratio

by Andy Lennon

The performance of an RC model aircraft in angle of climb and maneuverability is governed largely by the relationship between thrust and the model's weight. Where the thrust exceeds the model's weight by roughly 25 percent, the model can climb vertically almost to out-of-sight altitude and is highly maneuverable. If the thrust is half the model's weight, only a shallow climb is possible and its maneuverability is limited. Most models' thrust to weight ratios (TWR) fall between these extremes.

Power loading provides a means to relate power to weight. For example, a model weighing 92 ounces and powered by a .46ci-displacement engine has a power loading of 92 ÷ .46, or 200 oz./ci. Knowing power loading is useful when choosing an engine for a particular model (see Table 1) but is of little help in selecting propeller diameter and pitch. It also presumes that engines of equal displacement but of different makes are equally powerful; in practice, such is not the case (see "The Right Combination," Tables 2 and 3, in the August 2000 issue of *Model Airplane News*).

Static thrust is very misleading. The propeller with the lowest pitch and the largest diameter will give the most static thrust. When the plane is stationary, major portions of the blades on higher-pitched props are operating at an angle of attack that's beyond the blade airfoil's stall angle. They therefore produce little thrust but lots of drag, which reduces engine rpm. In level flight, this situation is reversed, and the higher pitches produce more thrust.

Obviously, what is needed is a simple but effective way to estimate thrust at the model's full-throttle, level-flight speed. The author has devised an empirical procedure to do just that. The engine and propeller of a model flying at its maximum level flight speed generate the required thrust by blasting a column of air backward. The equal and opposite reaction (Newton's Third Law of Motion—Sir Isaac, not Wayne!) propels

the model forward. That column of air has volume and weight that can be estimated using the following formula:

$$\text{Thrust in ounces per second} = \frac{AxBxCxDxE}{FxG}$$

Where:

A = area of the propeller disc in square inches. This is calculated with the following formula:

$$\frac{\text{prop diameter}^2 \times \text{pi (3.1416)}}{4}$$

B = nominal pitch in inches.

C = static rpm at which the prop spins.

D = 1.22416. This is the weight of one cubic foot of (standard) air in ounces.

E = 1.20. This is a constant that reflects the gain in rpm from static to level flight and the gain in actual pitch compared with nominal pitch. Find more details on this in my book, "The Basics of R/C Model Aircraft Design," (pp. 89-90).

F = 1728. This converts from cubic inches to cubic feet.

G = 60. This converts from minutes to seconds.

Obviously, the formula is unwieldy in this form. It is simplified by consolidating the constants into a single figure.

Thrust (ounces per second) = prop diameter^2 x nominal pitch x static rpm x 0.000011127.

If you know the pitch and diameter of your prop, the only other number you need is the engine's static rpm with that prop.

The above formula for thrust per second includes a constant (0.000011127) that reflects the standard barometric pressure at sea level. Modelers who fly at higher altitudes can expect a reduction in thrust owing to the lower air density. Modelers should substitute a constant that corresponds to the altitude at which they fly from the following chart.

Altitude (in ft.)	Constant
Sea level	0.000011127
1,000	0.000010806
2,000	0.000010490
3,000	0.000010182
4,000	0.000009881
5,000	0.000009587
6,000	0.000009301

Thus, a 10x9-inch prop rotating at 12,000rpm would generate:

10^2 x 9 x 12,000 x 0.000011127 = 120 ounces per second at sea level.

10^2 x 9 x 12,000 x 0.000009587 = 103 ounces per second at 5,000 feet.

Note that this example assumes that the prop turns at 12,000rpm at both elevations. In actuality, the rpm at 5,000 feet would likely be less due to the reduced air pressure. To obtain accurate results, use a tachometer to measure the actual rpm at the elevation in question.

THRUST TO WEIGHT RATIO (TWR)

Knowing the model's weight in ounces and the thrust from each prop, you can easily calculate the TWRs:

$$\text{TWR ratio (in percent)} = \frac{\text{thrust (oz. per sec.)} \times 100}{\text{Model weight (oz.)}}$$

For example, a model weighing 92 ounces with a thrust of 120 ounces would have a TWR of

$$\frac{120 \times 100}{92} = 130 \text{ percent}$$

SELECT A PROP USING THRUST TO WEIGHT RATIO

SPEED

Proper propeller selection requires that a model's speed be defined. Remember that rpm and pitch dictate the speed, while diameter and pitch dictate rpm. The model's wing loading has an impact on speed, but mainly on takeoff and landing speeds. Every model has a speed range, from its stall speed to its maximum mph. To select a speed, refer to Table 1. Choose your model's wing loading and average lift coefficient, then plot the two points on the graph shown in Figure 1 to determine the model's maximum level flying (MLF) speed.

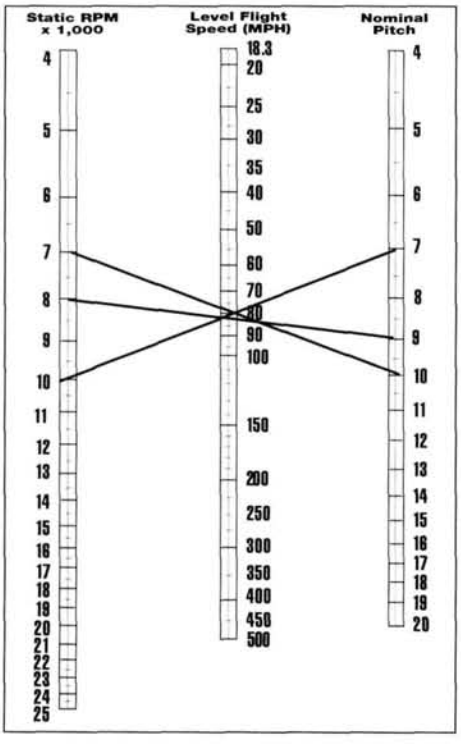
Table 1.

Model type	Speed range (mph)	Avg. lift coefficient	Wing-loading range (oz./sq. ft.)	Power loading (oz./ci)
Expert	100+	0.05	25 to 30	100 to 200
Intermediate	80 to 100	0.07	20 to 25	200 to 250
Trainer	60 to 80	0.11	15 to 20	250 to 300
Glow-powered glider	40 to 60	0.18	10 to 15	300+

Suppose you have a model with a wing loading of 20 ounces per square foot and a lift coefficient of 0.075. On the graph, follow the 20-ounce line to the point at which it intersects the 0.075 curve; then follow a horizontal line from that point to read the projected speed (80mph) on the left.

When you have your projected speed, plot that figure on the Figure 2 nomograph. You can see that 10,000rpm with a pitch of 7 inches and 7,000rpm with a 10-inch pitch both produce an MLF speed of 80mph. These figures are not cast in concrete; each pilot has his preference. Expert pilots like high speeds, while pattern pilots prefer moderate speeds that can be maintained in all maneuvers. The choice is yours, but this choice is basic to good prop diameter and pitch selection.

Figure 2. RPM, speed and prop pitch nomograph



PERFORMANCE

The objective is to select a prop diameter and pitch that will match the characteristics of your plane, engine and desired speed range. The first step is to establish the maximum level flight speed at which the plane is to fly (as already outlined). Then, using the available engine data, calculate the prop dimensions that best match the plane, engine and speed requirements. The exact procedure you follow will differ according to how much engine data is available to you.

Generally, engines fall into three groups:

- Group 1—engines that have been the subjects of published reviews that include a table of rpm with standard props and a chart with complete torque and brake horsepower curves, such as those in "The Right Combination" (referred to earlier).
- Group 2—engines that have been reviewed and for which there is a chart of rpm with standard props but no full torque and power curves.
- Group 3—engines that haven't been reviewed.

Group 1 engines: following the steps outlined in "Choose the Right Prop for your Engine" (June 2001 *Model Airplane News*), select the prop pitch and diameter that require the highest torque. If the prop's pitch and the rpm at which it spins do not produce the speed required, refer to Figure 2. Using the rpm of the prop that corresponds to the highest torque, determine the pitch needed to produce the MLF speed. Consult a supplier's catalog

Figure 1. Nomograph for quick determination of wing loading, lift and speed

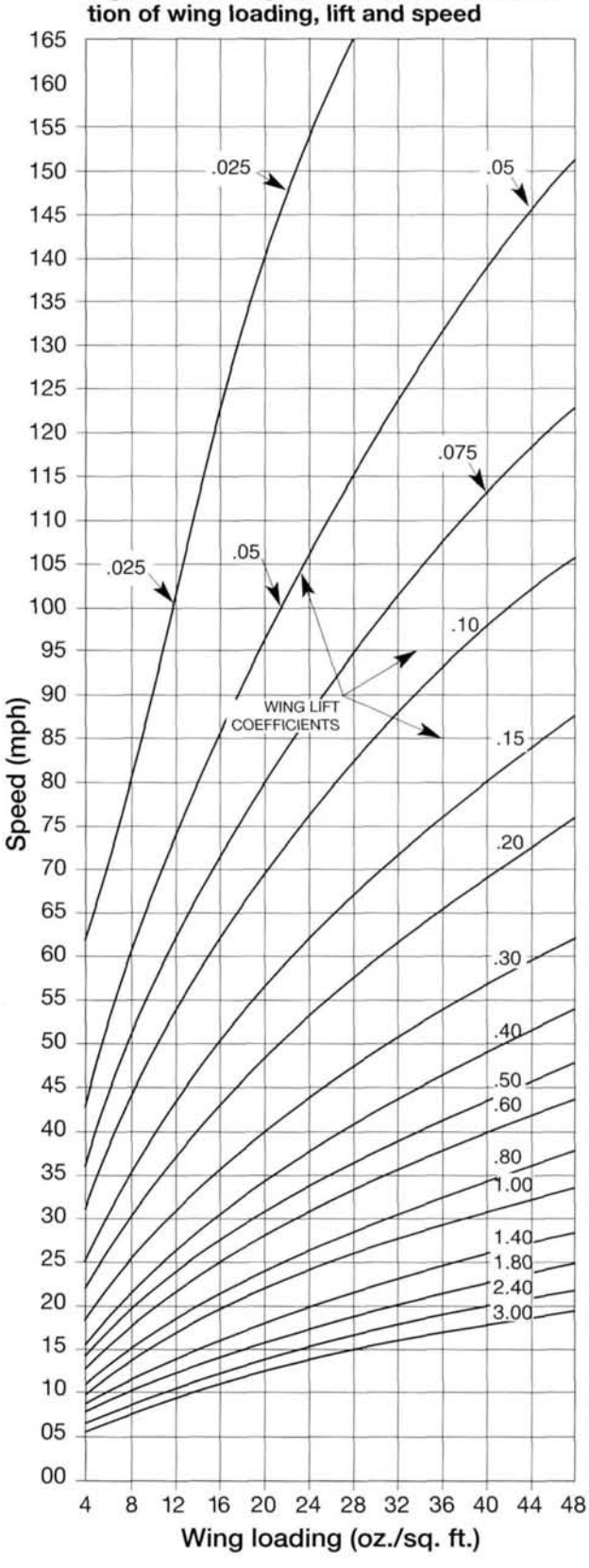


Table 2. Thrust to weight ratio percentage

Model	Engine	Prop diameter (in.)	Prop pitch (in.)	Rpm	Weight (oz.)	Wing loading (oz./sq. ft)	MLF speed (mph)	Thrust (oz./sec.)	Thrust to weight ratio (%)
EXPERT									
Aurum	SuperTigre .51	13	6	10,200	80	22.4	70	115	143
25% CAP 232	SuperTigre 2300	18	8	8,300	168	22.9	75	239	142
Swift	O.S. .46 SF	10	9	12,000	92	22	125	120	130
Crow	O.S. .45 FSR	10	9	10,500	88	25.3	105	105	119
INTERMEDIATE									
Seagull III	O.S. .46 SF	11	8	10,500	110	22.8	95	113	102
Sea Hawk	O.S. .46 SF	11	8	10,500	110	24.3	95	113	102
Gull Sport	O.S. .40 SFR	9	8	13,000	93	20.8	120	93	100
X's pattern ship	SuperTigre .90	16	6	7,800	136	24.4	55	133	98
Sparrow Hawk	O.S. .15 RC	7	6	11,000	38	22	75	36	95
P47D Thunderbird	SuperTigre .90	16	8	7,300	176	35.5	66	166	94
Robin	O.S. .46 SF	12	7	9,200	110	19.4	74	103	93
TRAINER									
Snowy Owl	O.S. .40 SFR	11	6	10,000	98	22	68	81	82
GLOW-POWERED GLIDERS									
Dove	O.S. .15 RC	8	4	12,000	55.4	13.2	55	34	61
Butterfly	10	6	3	12,000	50	7.8	45	14.5	29

for prop diameters of the specified pitch. If you require a lower speed, you need a larger diameter; for more speed, select a smaller diameter.

Calculate the propeller load factor (PLF) using Dave Gierke's formula, "diameter^2 x pitch," for the prop with the highest torque and for the potential replacements. The PLF closest to the highest-torque prop's PLF is the one to use. (This process is covered in more detail in "Choose the Right Prop for your Engine.") You can also plug the dimensions of the high-torque prop and its replacement into the thrust formula to confirm your choice.

Group 2 engines: calculate the thrust in ounces per second for all the props listed in the "Rpm with standard props" chart; this will take just a few minutes. The prop that produces the highest thrust probably brings the engine close to its peak torque and is the one to use, unless its rpm and pitch do not comply with your selected speed. Use the procedure outlined for Group 1 engines to identify the proper diameter and pitch.

Group 3 engines: consult Figure 2. Say your required speed is 80mph. A 10-inch pitch at 7,000rpm, a 7-inch pitch at 10,000rpm, or an 8-inch pitch at 9,000rpm will each produce 80mph. Select a pitch—say 8 inches—and obtain three or four props of that pitch but with differing diameters. Using a tachometer, measure the static rpm for each diameter and calculate the thrust for each. The prop that produces the highest thrust is the one to use.

To verify the thrust formula, the specifications of 14 models are listed in Table 2. Nine are the author's own designs, and most have been flown for many years. The last column lists their thrust to weight ratios. Being intimately familiar with their flight characteristics, the author states that the performance of each, in angle of climb and maneuverability, is reflected in each model's TWR percentage.

For example, the Swift, with its TWR of 130 percent, is capable of a sustained vertical climb and is a highly maneuverable expert-level model. The Robin has a TWR of 93 percent; it can climb steadily at an angle of 50 degrees to horizontal and is very maneuverable. Its MLF speed is 74mph. Thanks to its big slotted flaps, it has excellent short takeoff and landing characteristics and is representative of the intermediate class. The Snowy Owl is a trainer-class model with a TWR of 82 percent. It can climb steadily at 35 degrees and is moderately agile but is stable and easy to fly. Though its wing loading is high for a trainer, its slotted flaps permit short takeoffs and landings at under 20mph. The Dove is a glow-powered glider with a TWR of 61 percent. It has a shallow climb of 10 degrees and limited agility. Its speed of 55mph, its high aspect ratio wing and its low wing loading quickly get it to soaring altitude.

Table 3.

Class	Thrust to weight ratio (%)	Performance
Expert	110+	Sustained vertical climb, high maneuverability
Intermediate	85 to 110	Sustained steep climb, good maneuverability
Trainer	65 to 85	Modest climb, fair maneuverability
Glow-powered glider	25 to 65	Shallow climb, limited maneuverability

Table 3 shows suggested thrust to weight ratios for four model classes and the resulting performance.

CONCLUSION

The procedures detailed in this article are innovative but practical. Regardless of engine make, fuel used, or prop size, the thrust that you calculate using the method given here can be compared to the model's weight to provide a thrust to weight ratio percentage.

Readers' comments are welcome. Please write care of *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. A special thanks to pattern flier Xavier Mouraux for his fine cooperation and for contributing the Aurum, CAP 232 and X's.

THINKING BIG | *by Gerry Yarrish*

Hot new products for the summer

Nick Ziroli's new 22.5-percent scale Stearman PT-17 is a big, impressive biplane. Shown here in Navy N2S trainer colors, the model is powered by a Robart radial engine.

If you are like most modelers, when you are not actually building and flying model airplanes, you are probably talking about them. One of the greatest places I can think of to "talk airplane" is at a model airplane trade show. Here in New England, the granddaddy of them all is the Westchester Radio Aero Modelers (WRAM) show in White Plains, NY, and this year's show had plenty of new things to talk about. I have been attending this model showcase since I was a small balsa biter tagging along behind my father; I bought my first roll of MonoKote there and saw my first RC helicopter demo flight in the big parking lot across from the main entrance. For me, the WRAM show was—and still is—a great event where RC models rule the day.

In its 33rd year, the 2001 WRAM show was as busy as ever. I love walking down the aisles and bumping into old friends and flying buddies who are also looking for the new and interesting products that always show up there. For modelers who like to "think big," this year's show had a lot to offer.

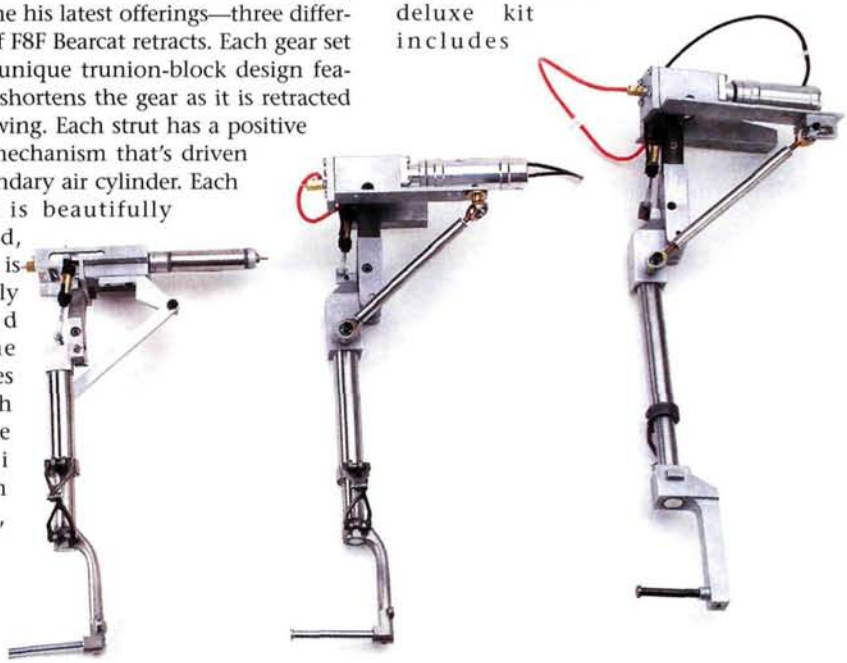
ZIROLI'S BIG STEARMAN

My first stop each year is the Nick Ziroli Plans booth. This year, Nick Sr. and Jr. had their new, enlarged PT-17 on display completely finished and detailed. Nick Sr. competed last year with the new Stearman at the Scale Master Championships in Dayton, OH, and he did very well. He says that it is just as delightful to fly as the smaller, 77-inch-span version. The big Stearman is 22.5-percent scale and has a wingspan of 87 inches. It is 68 inches long and has a wing area of over 2,250 square inches. The model uses Nick's standard balsa and ply construction design with formers and stringers assembled over a flat crutch structure. The finished model weighs between 32 and 35 pounds and is designed for use with a Zenoah G-62 gas engine. Nick's prototype is powered by a Robart 4-stroke, 7-cylinder radial engine. A set of Robart shock-absorbing Oleo struts is also available for the big biplane. Since I have retired my old Ziroli Stearman, I know I will have this one on the bench come next winter.

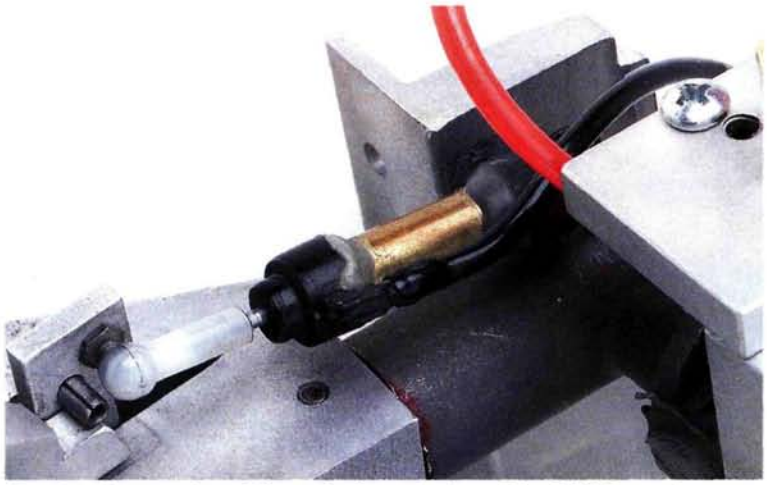
CENTURY JET RETRACTS

Bruce Sanders of Century Jet Models (CJM) showed me his latest offerings—three different sets of F8F Bearcat retracts. Each gear set has that unique trunion-block design feature that shortens the gear as it is retracted into the wing. Each strut has a positive up-lock mechanism that's driven by a secondary air cylinder. Each gear set is beautifully machined, and each is specifically designed for the Jerry Bates (80-inch span), the Ziroli (86-inch span), and the Cactus Aircraft (100-inch span) Bearcat models. If you have ever wanted to build a great big Grumman Bearcat but didn't because there weren't any scale landing gear available, CJM has just given you three good reasons to reconsider.

Also on display in the CJM booth was the company's Supermarine Spitfire MK 22-24. This 1/5-scale model has an 87-inch wingspan, is 76 inches long and is designed for a Moki 1.8 or larger engine. Flying weight for this composite model is 22 to 24 pounds. You can order the Spitfire in three ways: the basic kit comes with a primed epoxy/fiberglass fuselage, fiberglass vertical and horizontal stabilizers, molded accessory hatch, elliptical foam wing-cores, a formed canopy, detailed instructions, a full-size plan, 3-view drawings and a spinner. The deluxe kit comes with these items plus a basic cockpit kit, metal tiller arms, a laser-cut plywood package, a wooden parts package, an accessory package, pull/pull cables, bolts and nuts, snap-on door-mounting brackets and much more. An even more deluxe kit includes



New from Century Jet Models are three sets of Grumman Bearcat retractable landing gear. Available for the Bates, Ziroli and Cactus Aviation Bearcat designs, these gear are scale in operation with up-locks.



Here's a close-up view of the up-lock mechanism of the CJM Bearcat gear.

Top to bottom: this 103-inch AT-6 Texan ARF is from Giantscaleplanes.com. It comes as you see it, straight out of the box with panel lines molded into the fiberglass fuselage. • The Dave Patrick Models Extra 300L ARF weighs only 11 to 12 pounds and is powered by a 1.20 4-stroke engine. • On display in the Century Jet Models booth was this impressive Supermarine Spitfire Mk. 22 – 24.

everything mentioned plus the main-gear retracts and tailwheel unit. Other options, such as a scale, non-flying, 5-blade fiberglass prop and spinner, are also available.

GIANTSCALEPLANES.COM AT-6

Up on the WRAM show stage area, Irwin Siner of Giantscaleplanes.com displayed his new line of fiberglass ARF giants. The models included a 96-inch Sukhoi, a 98-inch P-51D Mustang and my favorite: a ⅛-scale, 103-inch-span AT-6 Texan. Perfect for a Zenoah G-62 (or larger) engine and a set of Robart retracts, this impressive ARF comes with a factory-finished fiberglass fuselage and film-covered wing and tail parts, a huge greenhouse canopy and a fiberglass engine cowl. Panel-line detail is molded into the fuselage and cowl, and all the control surfaces have beveled leading edges. All of the control-horn hardpoints come installed, and the one-piece wing is completely ready for hinging. The aileron servo pockets and wire channels are also cut out. If you want to fly a giant Texan at that next warbird fly-in, the Giantscaleplanes.com AT-6 will have you in the air in no time.

DAVE PATRICK MODELS EXTRA 300

The new Extra 300L from Dave Patrick Models looked great and is available in three varieties: as an ARF, covered as shown here; as an ARF, covered in white; and as a ready-to-cover (RTC) model. It has a 76-inch span and 1,220 square inches of wing area. Weighing only 11 to 12 pounds, this Extra is lightly loaded and would be ideally powered with a 1.20 4-stroke engine. According to Dave, the Extra, with its large, double-beveled control surfaces, is a great airplane to do 3D maneuvers with; its control response is great at any speed. The Extra also has an adjustable stab; you can easily fine-tune the stab's incidence with a small screwdriver. The Extra also includes a painted fiberglass cowl and wheel pants, fine-quality hardware, two decal sheets and a 48-page, photo-illustrated instruction booklet that includes hints and flying tips.

ROBART J-3 GEAR

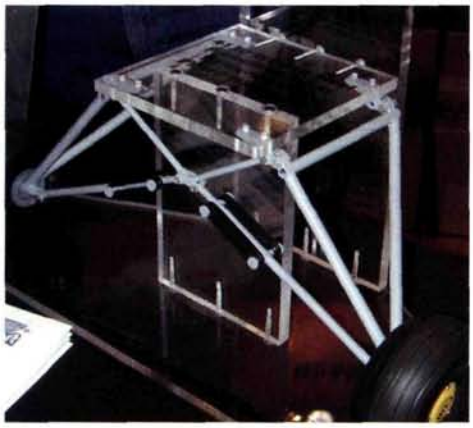
Known for their retractable landing gear, the clever folks at Robart Mfg. have come up with a great set of scale shock-absorbing fixed gear for Piper Cubs. The new landing gear fit Hangar 9's 100-inch ARF Cub and all other ¼-scale Piper J-3 and Super Cub kits. Made of welded 4130 steel-tube construction, the gear is fully articulated and features functional rubber bungees. They come primed and ready to paint or cover with cloth. The gear comes with a drilling guide for easy installation. These rugged units are excellent for other aircraft of similar size and will greatly smooth out those windy-day landings. I hear that ⅛- and ⅓-scale versions are also in the works.

I wish I could describe more of the wonderful items at the show, but my space is limited. If you're in the area and need a break from the New England winter blues, take a trip to Westchester County, NY, to attend this classic model show held annually during the last weekend of February.

REALLY SCALE PILOT FIGURES

We all know that a model airplane looks silly flying around without a pilot figure sitting in the main office. Some modelers go to great lengths to make their pilots look as real as the rest of the model. Have you ever wished you could show up at the flying field or the next club "show and tell" session with something unique? Well, I found just the thing while surfing the Internet one night: a company that could make a scale pilot figure of me! Now, that's a scary thought!

CrazyPilots is a Web company run by Byron Jungjareon of South San Francisco. Byron is a very talented sculptor who will make a miniature clay bust of you (or anyone else) in any scale you wish. From the clay bust, he produces lightweight, plastic resin castings. You have to send him front- and side-view pictures of yourself and tell him what scale you want your "mini-me" to be. I sent him a few digital images and asked him to make a ¼-scale figure from the



Robart Mfg. is now producing this welded steel-tube landing gear specifically designed for ¼-scale Piper Cubs. It has functional bungee shock absorbers.

shoulders up (yes; Byron also does full-figure pilots).

Byron then sent me an email saying when he'd finish the job, and I sent him a check. After only a few weeks, I received an email with an attached photo of the unpainted clay master for my approval. I was pleased and gave Byron the go-ahead to cast the figure. In about 10 days, my figure came in the mail, and I was as happy as I could be with what Byron had done. You can order any size figure you want, including ⅙, ⅕, ¼ and even ⅓ and larger scales. You can also get your figure in civilian, WW I or WW II style complete with Mae West vest, leather helmet and goggles. I paid $95 for my civilian figure; this included hand-painting, the addition of a headset and boom mike and shipping. Smaller figures cost less; bigger ones cost more. The more figures you order from the clay master, the less expensive they are. If you want the ultimate scale pilot figure for your next scale big bird, Byron and CrazyPilots will set you up! ✈

The ultimate in scale fidelity. This little fellow is a ¼-scale version of me; isn't he handsome? You, too, can have a pilot custom-made in your own image by CrazyPilots.

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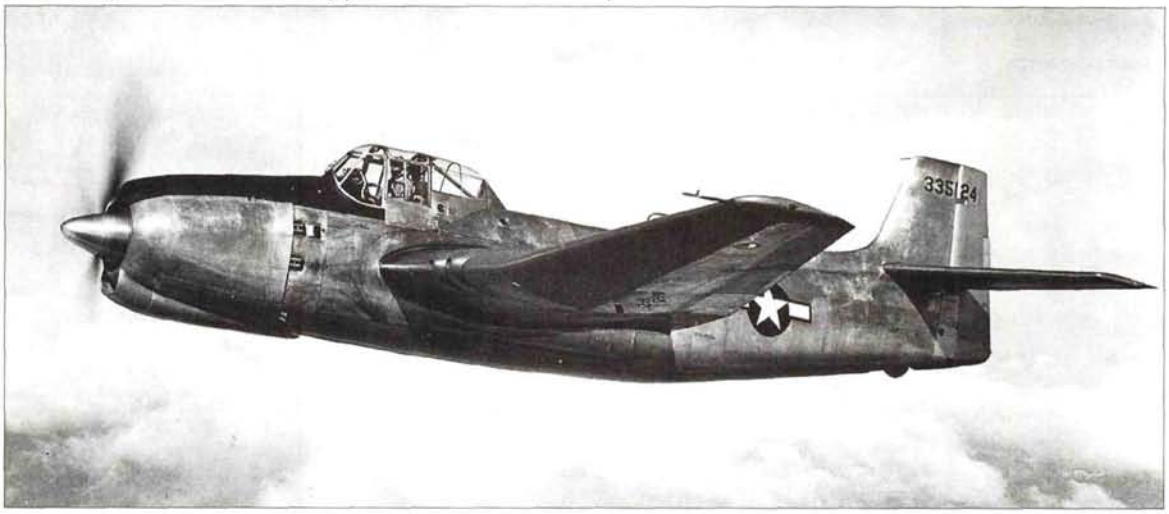
EVENTS

"T.O.C. OF MARYLAND– 2001" will not be held this year so that we can host the Mason/Dixon Aerobatic Challenge IMAC competition, June 1, 2 and 3, 2001. Food, raffles, prizes, free-style demos. For more info, contact: Andy Kane, (301) 236-9222, or Art Vail, artvail@aerols.com. [7/01]

NAME THAT PLANE

Can you identify this aircraft?

Send your answer to *Model Airplane News*, **Name that Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606 USA.



James Love of Los Lunas, NM, was one of only a handful of readers to correctly identify the May 2001 mystery plane as the Sandringham—a postwar, commercial version of the Short Bros. Sunderland. The Sunderland's gun turrets were replaced with streamlined fairings, and the inside of the plane was remodeled to accommodate up to 24 passengers. Produced in 1945, the Sandringham pictured was the first of six versions. Like the Sunderland, the original Sandringham was powered by Bristol Pegasus 38 engines; later versions featured Pratt & Whitney Twin Wasp engines. ✈

The winner will be chosen, four weeks following publication, from correct answers received (delivered by U.S. mail) and will be awarded a free, one-year subscription to *Model Airplane News*. If already a subscriber, the winner will be given a free, one-year subscription extension.

THIS ISSUE'S FEATURED PLAN

A-10 Warthog
FSP 0701A

Designed by Keith Sparks, the A-10 is a low-wing trainer that looks like a Warthog. It has a flat-bottom trainer-wing airfoil and good slow-speed flight performance. It is easy to build and fun to fly.
WS: 61 in.; L: 50 in.; power: two .25 2-strokes; radio: 4-channel; 2 sheets; LD 2. **$21.95**

LAST ISSUE'S FEATURED PLAN

SkyVolt
FSP0601A

This fun little park flyer is meant to be hand-launched. The model is very light and uses stick construction. The wing is glued to the fuselage, and the motor is attached to a vertical pylon. The rudder and elevator use pull/pull threads for control.
WS: 43 in.; L: 32.5 in.; radio: 3-channel; power: geared Speed 400 motor; prop: APC 8x7; 1 sheet; LD 2. **$14.95**

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An RC tribute to Dutch aviation

A group of Dutch modelers has undertaken a unique and formidable task—constructing and flying scale models of nearly every plane that ever served in the Royal Netherlands Air Force (RNLAF). The PHantasy in Blue Foundation is a nonprofit organization that pays tribute to Dutch aviation by developing large-scale models of both vintage and modern Dutch aircraft for exhibit at festivities such as airshows and reunions. It is one of the only organizations of its kind in the world.

Glenn Martin 139/WH3 bomber by T. Gordijn; a very impressive model in flight and on the ground.

Established on September 20, 1995, in coordination with the RNLAF and the Royal Netherlands Aeronautical Association (RNAA), the foundation's name is loosely based on the George Gershwin classic, "Rhapsody in Blue"; the letters P and H are the national code of the Dutch aircraft registration system. The foundation has grown rapidly since its birth, thanks to the generous support of companies such as Fokker, KLM and the RNLAF, as well as that of many Dutch scale modelers.

The F-1-4G "Starfighter" is built by Frans Feijen. The model is powered by an AMT Pegasus turbine, generating 45 pounds of thrust.

A few years ago, Deelen airbase was the site of a memorable airshow that showcased 35 models of KLM and Fokker aircraft in celebration of the 75th anniversary of both companies. That event attracted as many as 35,000 enthusiastic visitors. Many of the models have also been displayed in neighboring countries, including Germany, Belgium and England.

The PHantasy in Blue Foundation is currently working on a series of RNLAF models built to ⅛ scale. The Commander in Chief of the RNLAF selected the designs for the new series; they range from the first "wind in the wire"-type aircraft and WW II bombers to modern jet fighters.

Willy van de Elsen prepares his 168-inch Fokker T-V bomber for yet another flight. The 40-pound model has two Zenoah 2.8 engines to provide the necessary power.

Wilfried Wolterinck starts the Pegasus engine on his Gloster Meteor Mk IV. Several models of this type have already been built and flown. The model uses two AMT Pegasus engines.

A neat pilot occupies the cockpit of Jan van Harn's Hawker Hunter Mk.IV.

Successfully completing such a demanding task requires a vast amount of hard work and knowledge. Modelers who are interested in taking part in the project must first register with the foundation and are then selected and assigned to work on a specific model—as an individual or on a team.

For each project, the Air Force provides detailed information about the original plane, as well as financial support, but the modelers are responsible for every other detail involved in building and flying the planes. Every member is obligated to build the plane within a specified period of time and must keep it airworthy for 10 years after its completion.

Many of the models are made out of fiberglass and foam, but ultimately, it is the modelers who decide which method of construction they prefer. All of the plans are reviewed by full-size aircraft designers, as well as by fellow team members, to make sure that there are no structural mistakes.

Since the start of the project, many teams and individuals have contributed by documenting, designing, building and testing a wide variety of models. The result of so much effort is the creation of the world's first fleet of RC model aircraft that accurately reflect the development of the Netherlands Air Force. More important, the PHantasy in Blue Foundation is preserving a piece of Dutch national history to share with large audiences.

Such a massive project would be impossible without sponsorship. The PHantasy in Blue Foundation is blessed with financial support from several major European firms, including AMT (turbines), Tony Clark (Zenoah engines) and Volz (servos).

Approximately 50 aircraft are scheduled to be built over the next several years, and as time and money permit, many more are sure to follow. For more information, see the PHantasy in Blue website: www.phblue.com.